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ABSTRACT

Critical thinking has received much attention among educators yet remains largely undeveloped in traditional teacher-centered classrooms. A study was conducted to: (1) obtain a sense of what secondary school teachers believe critical thinking entails; (2) compare and contrast British Columbia (BC), Canada, and Japanese secondary teachers' conceptions of critical thinking; (3) investigate the nature of BC and Japanese secondary teachers' conceptions of critical thinking with respect to gender, age, teaching experience, and subject taught; and (4) determine whether critical thinking is a significant part of BC and Japanese teaching and the curriculum at the secondary level. Over 150 teachers from BC and Japan were asked to: (1) sort through 50 potential definers denoting possible attributes of critical thinking; (2) rank the 10 most significant; and (3) answer a questionnaire about the nature of critical thinking. Quantitative data, reduced through factor analysis, yielded a 5-factor solution: Scientific Reasoning, Cognitive Strategizing, Conscientious Judgments, Relevance, and Intellectual Engagement. From a synthesis of quantitative and qualitative data from teachers surveyed as well as expert opinion, critical thinking was found to be a process in which an individual is actively engaged in analyzing, reasoning, questioning, and searching for alternatives to solve a problem or to make a decision or judgment. While over half the teachers indicated critical thinking was part of their curriculum and teaching, many were unable to articulate how to teach it effectively, and there were significant differences in their conceptions of critical thinking. (Contains 7 figures, 11 tables, and 83 references. Teacher questionnaires in English and Japanese, critical thinking definers spreadsheet, and related component matrix of 50 definers are appended.) (Author/BT)

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SECONDARY SCHOOL TEACHERS' CONCEPTIONS OF CRITICAL THINKING IN BRITISH COLUMBIA AND JAPAN:

A Comparative Study

by

EDWARD RONALD HOWE

B.Sc., University of British Columbia, 1988
B.Ed., University of British Columbia, 1992

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We accept this thesis as conforming
to the required standard

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ABSTRACT

Critical thinking has received much attention among educators, yet remains largely undeveloped in traditional teacher-centred classrooms. Critical thinking is used in at least three major contexts: (1) the media and general public, (2) teacher pedagogy, and (3) academic discourse. Critical thinking must be better understood by individuals within all three levels. The purposes of this study were (1) to obtain an overall sense of what secondary school teachers believed critical thinking to entail; (2) to compare and contrast B.C. and Japanese secondary teachers' conceptions of critical thinking; (3) to investigate the nature of B.C. and Japanese secondary teachers' conceptions of critical thinking with respect to gender, age, teaching experience and subject taught; and (4) to determine whether critical thinking is a significant part of B.C. and Japanese teaching and the curriculum at the secondary level.

Over 150 secondary teachers from B.C. and Japan were asked to (1) sort through 50 potential definers denoting possible attributes of critical thinking; (2) rank the 10 most significant to critical thinking; and (3) answer a questionnaire about the nature of critical thinking.

The quantitative data, effectively reduced through factor analysis, yielded a five factor solution: *Scientific Reasoning, Cognitive Strategizing, Conscientious Judgements, Relevance,* and *Intellectual Engagement*. B.C. teachers conceptualized critical thinking through *Cognitive Strategizing* and *Relevance,* while Japanese teachers favoured *Conscientious Judgements* and *Intellectual Engagement.* From a synthesis of quantitative and qualitative data from teachers surveyed as well as expert opinion, critical thinking was found to be a process in which an individual is actively engaged in analyzing, reasoning, questioning, and creatively searching for alternatives in an effort to solve a problem or to make a decision or judgement. Teachers indicated that critical thinking was not rote memorization, demonstrating factual knowledge, comprehension or application. It was more than following a given algorithm or set of procedures. While over half the teachers surveyed indicated critical thinking was part of the curriculum and their teaching, many were unable to articulate how to teach it effectively. There were significant differences in teachers' conceptions of critical thinking. Culture accounted for more differences than gender, age, teaching experience, subject area, or the teaching of critical thinking. Using discriminant analysis, 27 definers distinguished between B.C. and Japanese teachers. While B.C. teachers tended to choose "Decision making," "Problem solving," "Divergent thinking," "Metacognitive skills," "Higher order thinking," "Deductive reasoning," and "Identifying/removing bias," Japanese teachers tended to chose "Fairness," "Adequacy," "Objective," "Consistency," "Completeness," Precision," and "Specificity." Over 96 percent of the teachers were correctly classified by culture.

Further research is necessary on how to teach critical thinking across the curriculum and successfully integrate it with B.C. and Japanese educational reforms in areas such as curriculum development and teacher training. Critical thinking is a Western expression, yet the concept is not confined to the West. The author proposes the use of a new term for critical thinking with less emphasis on "critical" and more emphasis on "thinking"—*kangaeru chikara* or "powerful thinking" better encompasses the nature of critical thinking as it is conceived by B.C. and Japan's teachers. Teacher training must incorporate powerful thinking and teachers must model critical thinking, for any effort to reform the structure or organization of education ultimately depends on the effectiveness of the teacher.

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CHAPTER 1

INTRODUCTION TO THE STUDY

Like many other regions in the world, British Columbia is undergoing major changes in education. Educational reforms reflect international trends in education, advancements in communication technology and globalization of the economy. It is important, however, not to lose sight of the ultimate goal of these reforms—to improve student learning. In particular, educators are interested in teaching strategies that will improve student learning within the context of an ever-shrinking world. It was with this in mind that the *Critical Thinking Cooperative* was formed in 1994 as a project involving school districts, the Ministry of Education, and other educators across the province. Its purpose was to support learning and assessment resources and long-term, field-based professional development in the area of critical thinking. Similarly, in the UK, the *Oxford Centre for Comparative Studies* was formed in 1990. Its mandate was to make contributions to two important questions in the study of comparative education: (1) What lessons can be learnt from cross-national studies of issues in education? and (2) What problems of comparative methods do such studies have to address? Its first published paper raised the question... "what are the specific lessons that the British could learn from the Japanese education system..." (Phillips, 1990, p. 159). Much literature in this field has drastically oversimplified the Japanese educational system. It is the opinion of many researchers in comparative education that there is much work to be done in this field.

In 1990, the Alberta Department of Education set up a committee to investigate the curriculum, values and lessons from other countries, principally Japan and Germany. Their report, *International Comparisons in Education,* stated that there are no definitive measures that compare Alberta directly with international systems. Canadian comparisons are flawed due to a lack of empirical research and therefore open to controversy. The report recommended several education practices from the comparison countries, transferable to Alberta, regardless of societal differences. These practices included teacher training and school administration (Alberta Dept. of Education, 1992, pp. 1–3).

In Tokyo, Japan, the National Institute for Educational Research (NIER) made similar recommendations including nationwide and international comparative studies on achievement with a focus on learning motives, attitudes and thought processes of individuals. The NIER made several recommendations to the Japanese government including: an emphasis on individuality, cultivation of creativity, thinking ability and power of expression, humanization of the educational environment and coping with internationalization (NIER, 1986a, 1986b). Similarly, in British Columbia, the Ministry of Education has mandated that by the year 2000, all curricula would emphasize problem-solving and critical thinking, literacy and communication, team work and information technology (British Columbia Ministry of Education, 1993).

The Problem: Critical Thinking Misconceptions

It would appear that "critical thinking" is an integral part of educational reforms in Japan and North America (Monbusho, 1992, 1995; Norris, 1988; Schlechty, 1997). In British Columbia and elsewhere, there is much talk among educators, politicians and the media. However, much is idle rhetoric, as "critical thinking" has become the latest "buzzword" in education. Everyone seems to agree on its importance, yet few articulate exactly what they mean by "critical thinking." Here are examples from recent newspapers:

> You need to be able to **think very critically** and be highly literate to use the Internet effectively, says Terry Clark, the head of Vancouver Public Library's children's division (*Vancouver Sun*, October 20, 1998, p. A1).
>
> Kit Krieger, president of the B.C. Teachers Federation, suggests that instead of asking "what did you do in school today," ask your child what questions were raised in his or her mind today. That was the question asked by the parents of Nobel physicist Hans Bette when he was a student. It developed **critical thinking** rather than absorptive learning (*Vancouver Sun*, January 15, 1999, p. B7).

Ted McCain and Bill Henderson, two innovative B.C. teachers awarded the Prime Minister's Award for Teaching excellence espouse their views on the importance of teaching "critical thinking":

> McCain and Henderson say although their students leave high school with highly marketable, cutting-edge skills, the technical lessons are the least important thing they take from the classroom. The focus of their teaching is problem-solving, **thinking critically** and working as a team (*Vancouver Sun*, June 23, 1998, p. B4).

"Critical thinking" is no longer relegated to the pages of scholarly journals nor is it merely the hot topic of educational philosophers. Rather "critical thinking" is now in the public's vocabulary, however its meaning remains vague and convoluted.

Background to the Study

Critical thinking has received much attention among educators, yet remains largely undeveloped in traditional teacher-centred secondary school classrooms. At present, there is much research in progress on the meaning, transferability, and methods of teaching critical thinking. However, there is still debate about what is meant by "critical thinking." While espoused by educators and employers both in B.C. and Japan, there has been little examination of the way critical thinking is understood within these two education systems. Prior to this study, based on searches of educational databases including ERIC and the world wide web, there was no data which compared critical thinking in B.C. and Japan. In order to foster critical thinking by students, teachers must first critique present educational practices and the beliefs underlying them. To understand the nature of critical thinking, educators must be asked questions about the nature of knowledge, learning and the process of thinking.

Rationale and Conceptual Framework

Comparative Education is not yet a cohesive discipline but is rather an eclectic mix of approaches within a broader field. The spectrum of approaches range from cultural relativism to positivism. Many comparative education researchers' conceptual frameworks lie somewhere within these boundaries, for they are not necessarily mutually exclusive concepts. However, attempts to formulate methods that draw on both ends of the spectrum have largely not been successful. Noteworthy exceptions may include the case study, morphogenetic approach and Holmes' problem solving approach (Epstein, 1988). While this study is decidedly positivist in nature, the author recognizes the importance of cultural relativism and positivism to comparative education, as 'comparison' has different meanings for positivists and relativists.

Cultural relativism uses comparison to gain a mutual respect for differences while guarding against ethnocentrism. For the relativist 'comparison' is not a generalizing process but is instead a method to discover cultural absolutes. Herskovits, Boas, and Benedict were among the first researchers to use cultural relativism, believing all assessments were made relative to standards derived from culture (Epstein, 1988). Cultural relativism denies that meaningful cross-cultural comparisons are possible as all educational phenomena are embedded in cultures that are unique. Thus, cultural relativists would seem at odds with those who embrace the roots of comparative education and who are largely positivists.

Positivism has been comparative education's mainstream tradition since Marc-Antione Jullien set the stage in the early 19th century. Sir Michael Sadler, also saw the practical value of studying foreign education systems in order to make improvements at home. For over one hundred and eighty years, positivist scholars have examined invariant relationships transcending the boundaries of particular societies. From comparative education's 'founding fathers' Jullien and Sadler, to their modern contemporaries Noah and Eckstein, positivism has prevailed.

> Although there are grave problems inherent in every effort to study education and society comparatively, and severe additional problems raised by attempts to apply social science techniques to comparative work, the promise both of the general field of comparative education and the specific methods advocated here remains great. The potential of the field, as we have argued, lies first in the promise of extending the generality of propositions beyond the confines of a single society; second, in the provision of an arena where propositions, testable only in a cross-national context, can be investigated; third as a field for interdisciplinary work; and finally, as an instrument for planners and policy makers (Noah & Eckstein, 1998, pp. 28–29).

From a positivist perspective, cross-national data can be used to test and verify propositions about relationships between teaching practices and learning outcomes. Thus, in comparing B.C. and Japanese teachers' conceptions of critical thinking, a positivist approach was used in order to seek meaning that transcended the two cultures.

The rationale for doing a study of this nature is perhaps not immediately obvious. Some educators initially may feel the two educational systems (and cultures for that matter) are so dissimilar that little can be gained from one studying the other in any detail. However, much can be learned from cross-cultural comparisons (Cummings & Altbach, 1997; Ellington, 1992; Epstein, 1988; Harada, 1993; Howarth, 1991; Kobayashi, 1990; New York State Education Dept., 1992; Rohlen & LeTendre, 1996; Shimahara & Sakai, 1995; Schriewer, 1988; Stevenson & Stigler, 1992). However, comparisons have led to an international economic competitive agenda, and what Thomas Rohlen, author of the well-known study: *Japan's High Schools*, calls "the rising tide of naive enthusiasm for education's benefits among economists, scientists, business people, (and) elected officials" (Rohlen, 1995, p. 104). Rohlen reflects further on the Western perceptions of Japanese education and international competition by stating:

> Our defensiveness, for whatever reason, has led to distortions in the public image of education in East Asia. Portraits emphasizing "exam hells," authoritarian teachers, student malaise, lack of creativity, and excessive conformity are common. These portraits raise doubts that there is anything to be learned from school systems with such a seemingly alien character. Success at such a price, we say to ourselves, is actually no success at all. I cannot agree. I think I speak for most of my colleagues who study Asian education in asserting that there is much to learn. We find many faults with Asian systems of education and do not always agree on what is most important to their success. However, these differences make for lively debate, not dismissal of the topic. We seek to understand first and only then to draw practical lessons (1995, p. 104).

On a personal note, as a secondary school teacher with experience teaching in both B.C. and Japan, I have a great interest in comparative education. After spending two years teaching at several junior high schools in Tokyo, I was impressed by the organization, teacher acculturation and ethos of Japanese schools. At the same time, I also noted deficiencies in teaching strategies and initial teacher training. It occurred to me that much could be gained from comparing different education systems and borrowing ideas from abroad. You could say that I was enlightened from my experience overseas and reborn as a comparative educator!

Increasingly, Japanese educators are coming to Canada and the U.S. to learn about Western educational systems. Over 3000 teachers are sent abroad every year (Kobayashi, 1993, p. 11). Since 1993, over 600 Canadians per year have taken part in the Japan Exchange and Teaching (JET) Program (Monbusho, 1996, p. 51). They are doing so because of the internationalization of education, globalization of the economy, and increased trade and tourism. And by their presence, great forward strides have been made in international education and the exchange of ideas.

Both B.C. and Japan stand to benefit from this comparative study. In particular, this thesis should be of interest to comparative education researchers, education policy makers, teacher educators, and secondary school teachers. Researchers, educators and classroom teachers can gain insights into the nature of critical thinking. The cross-cultural lessons learned can be used to improve teacher education programs and subsequently curriculum and classroom teaching should change in order to enhance student learning.

Research Methodology and Data Analysis

The task of this thesis was to compare and contrast B.C. and Japanese high school teachers' conceptions of critical thinking across the dimensions of culture, subject taught, experience, age and gender. In order to facilitate this comparison, a two part survey instrument was designed (see Appendix A for the English version and Appendix B for the Japanese version). After a pilot study and double-translation, definers or descriptions of critical thinking (words and phrases denoting critical thinking) were printed on 50 index cards (in English on one side and Japanese on the other). Teachers (n=159) from four Japanese and six B.C. public high schools were asked to sort the critical thinking cards, choosing only relevant ones. From these, they were required to rank the ten most significant. The results of this card-sort procedure were recorded in a spreadsheet (see Appendix C). Thus, quantitative data was collected from the card sort procedure and questionnaire in addition to qualitative data from open-ended questions.

Critical thinking, while valued by most teachers, remains a concept that is not well understood. In particular, teachers have difficulty expressing how critical thinking can be taught. It is hoped that this study will contribute to the field of comparative education and knowledge of critical thinking—a topic of great interest to educators in B.C. and Japan.

Purposes

The purposes of this study were:

(1) To obtain an overall sense of what secondary school teachers believed critical thinking to entail.

(2) To compare and contrast B.C. and Japanese secondary teachers' conceptions of critical thinking.

(3) To investigate the nature of B.C. and Japanese secondary teachers' conceptions of critical thinking with respect to gender, age, teaching experience and subject taught.

(4) To determine whether critical thinking is a significant part of B.C. and Japanese teaching and the curriculum at the secondary level.

Organization of the Chapters

In the following chapters, the nature of critical thinking in B.C.'s and Japan's secondary schools is analyzed and compared. Chapter 2 provides an overview of education in B.C. and Japan. Chapter 3 deals with the concept of critical thinking. Chapter 4 details the research methodology, while Chapters 5 and 6 report the results of the study. Chapter 7 discusses teachers' conceptions of critical thinking and offers a comparative perspective. Finally, Chapter 8 serves as a conclusion and summary of the research findings.

CHAPTER 2

EDUCATION IN BRITISH COLUMBIA AND JAPAN

Throughout time, civilizations have asked questions and sought answers in a search for knowledge. Education has always been an essential part of any society. To better understand critical thinking in B.C. and Japan, first it is necessary to understand the broader context of education within the two regions.

Education in British Columbia

B.C. continues to be a pioneer in progressive reforms to education. At the dawn of the information age, B.C. is poised to become a world leader in the role of teachers and the effective use of information technology, however further improvements in education are necessary for B.C. to prepare students for the challenges facing them. In particular, teacher education must change in order to reflect the changing needs of society.

Historical Perspective

Education in British Columbia has evolved from the one-roomed rural schools of the late 1800s to the present complex system. During the 1990s, nearly half the 75 school districts were in the process of amalgamation and centralization. Due to a huge increase in population, B.C.'s schools were overcrowded and under-funded (BCTF, 1998). There was an explosion of E.S.L. students, especially in the Lower Mainland. These factors have combined to produce a difficult and changing environment for education in B.C.. In addition, there have been sweeping changes to the curriculum in order to reflect the need for critical thinking. In 1988, the Eighth B.C. Royal Commission on Education reported on the state of education in B.C.. As a result, many reforms took place including criterion referenced assessment, peer evaluation and a focus on student-centred approaches to learning. Currently, the curriculum is divided into three programs: primary (K–3), intermediate (4–7), and secondary (8–12). Curricular decisions are made by the B.C. Ministry of Education while the responsibility for teacher training and certification is left to the B.C. College of Teachers (BCCT). The BCCT is comprised of fifteen teachers, two cabinet appointees, two Minister of Education appointees and one representative from the Deans of the Faculties of Education. Prior to 1988, there was little accountability and few standards for teachers. Since the BCCT was established however, teacher qualifications and teacher education programs have improved.

Until the mid-1960s, higher education in British Columbia was provided almost exclusively by its universities. During the 1960s, however, as the demand for greater variety in post secondary education rose sharply and enrollment expanded, systems of publicly operated post-secondary non-university institutions began to develop. Enrollment steadily increased during the 1950s and 1960s with the expansion of the economy. More and more people were obtaining high school diplomas. In the late 1960s and the 1970s many more were going on to college and university. "Human capital" was considered of primary importance to the growth of the economy. However, during the early 1980s, the economy slowed down and unemployment rose. In the 1990s, the government recommended a closer fit between the educational system and the labour market, yet unemployment and underemployment remained (Livingstone, 1996).

Higher Education

Virtually all Canadian post secondary institutions, including the universities, offer both full and part-time adult education. Over the past 20 years, with the emphasis on lifelong learning, there has been a marked increase in the number of students from outside the usual 18–to–24–year-old age group; in 1990, 24 percent of university students were over the age of 24 compared with almost 18 percent in 1970–71 (Statistics Canada, 1996). Currently, more than 55 percent of all university students are women, and more women receive university qualifications than men. Similarly, over 53 percent of full-time college students, and nearly 63 percent of part-time college students are women. Adult education is a fast-growing sector. In 1990, for example, 3.4 million adults or approximately 20 percent of Canadians were taking part-time courses (Statistics Canada, 1996). Canadian post-secondary institutions have developed comprehensive, diversified systems of education, designed to be universally accessible, responding to the diverse needs of its residents.

Teacher Education

Teacher education in B.C. has progressed substantially since the Normal schools of the early part of this century. Even as recently as the 1960s it was possible to teach in B.C.'s public schools with little or no formal teacher training. This has changed a great deal in the last decade. Teaching has gradually been gaining status as a legitimate profession like medicine or law. Since 1988, teacher education and certification in B.C. has been regulated by the British Columbia College of Teachers. All teachers since 1988 must have obtained the equivalent of at least five years of university training in an approved post-secondary program leading to a Bachelor of Education degree. Upon completion of either the elementary or secondary program, graduates must then apply to the Teachers' Qualification Service and the BCCT in order to have their academic credentials assessed. The B.C. Professional Teaching Certificate issued is valid indefinitely for as long as the individual continues to remain a member of the College in good standing.

The Two Year Elementary Teacher Education Program at the University of British Columbia (U.B.C.) is open to applicants who have completed a minimum of 90 credits in Arts, Science or Human Kinetics, including relevant pre-admission studies. The Twelve-Month Elementary Teacher Program, the Pilot Middle School Teacher Education Program, and the Secondary Teacher Education Program are open to applicants who have completed a four year Bachelor's degree which includes relevant pre-admission studies. Admission to teacher education is limited by the available spaces in each program and employment prospects. Because of the competition for admission, students are often required to have a grade point average well above the 65 percent minimum. Initially, candidates develop a foundation of teaching through courses designed to provide a balance of general and specialized knowledge about curriculum and instruction, including pedagogical knowledge, educational psychology and special education. In addition, students have a two week practicum for observations and orientation to the school in which they will be doing the extended practicum. After the first semester of study, students enter a 13 week extended practicum consisting of a 20–30 percent teaching assignment, which is gradually increased to 80 percent for the final 4 weeks. By the time they successfully complete the extended practicum, students should have demonstrated that they can plan, implement and evaluate instruction at a standard expected of a beginning teacher. After the practicum, students return to campus for one semester to engage in studies designed to put their teaching experiences in a broader context.

Simon Fraser Universtiy (S.F.U.), The University of Victoria, Trinity

Western University as well as other B.C. University-Colleges all offer programs for teacher preparation. However, teacher education at B.C.'s other institutions varies somewhat from U.B.C.'s model. S.F.U. has students take two practica. One is a four-week practicum, done at the beginning of the program, before any significant course work has been completed. The other is a ten week intensive practicum that demands that the student must teach a full course load over at least a six week period. S.F.U.'s program attempts to place more emphasis on a variety of practicum experiences and on the beginning teacher as a reflective practitioner. There is decidedly less emphasis on pedagogical theory and teacher education courses.

Based on this writer's personal experience in U.B.C.'s program (1989) and role as a sponsor teacher (school associate) in S.F.U.'s program (1996, 1998), U.B.C.'s program offers a good balance of pedagogical and practical training. Having the extended practicum in the same school as the initial two week practicum after the course work offers greater continuity. Also, by gradually increasing the teaching load, the student teacher can concentrate on daily lesson planning and the longer outlook of unit planning. In this writer's experience, the S.F.U. program does not prepare students for the rigorous teaching load of the ten week practicum. Also, by having two practica in different schools with different school associates, the practica are a discontinuous and stressful experience as a result. Neither program is ideal, in comparison to Japan's teacher education.

Education in Japan

In the 1980s and 1990s Japanese institutions of education underwent significant changes. Japan's revised model of education has much to offer. In particular, the enculturation of beginning teachers shows great promise. However, many reforms were not sufficient to address the major problems facing Japan's students. Recent calls for educational reform, driven by slow economic growth and structural changes to industry, further illustrate the need for comprehensive changes to Japan's rigid authoritarian education system.

Historical Perspective

Japanese culture and tradition have played an important role in shaping the education system. Since the Meiji restoration in 1868, Japan has increasingly looked beyond her shores for ideas and more efficient ways of accomplishing things. The Japanese are remarkable in the way they have been able to take good ideas from abroad, perfecting and adapting them for their own purposes, while maintaining their culture and traditions. Education is a prime example of this. By learning Western methods of production and adapting the Western model of capitalism to suit their culture, Japan evolved from a feudal state to a modern industrial nation in a short period of time. Emperor Meiji understood that in order for Japan to be competitive in the post-industrial world, the country would have to learn to be "modern." He sent scholars to Europe, North America and Asia to study the education systems of other countries. Japan opened its doors to the rest of the world for the first time in the history of the nation. This proved to be the single most important factor influencing Japanese education.

After World War II, during the occupation, Japanese education was modeled on the American 6–3–3–4 system. In 1947, the Fundamental Law of Education and the School Education Law were enacted. Under these laws a formal educational system was established on the principle of equal educational opportunity. In 1948, a new system of upper secondary schools was established.

Universities started under the new system in 1949, and junior colleges in the following year. However, curriculum and instruction in Japanese public schools, underwent little change as a result (Beauchamp & Vardman, 1994; Okano & Tsuchiya, 1999; Rohlen, 1983; Shields, 1993; Takakura & Murata, 1998). Japanese secondary school education is still characterized by a didactic teaching, rote memory style of learning very similar to the American and British public schools of the late 1800's—the very system it was modeled after (Rohlen & LeTendre, 1996, p. 317). This situation is about to change however, as Japanese education is poised to undergo a major paradigm shift from rote learning to critical thinking (Takakura & Murata, 1998). Recently, the Japanese Ministry of Science and Education (in Japanese- *Monbusho*) initiated significant and far reaching reforms to ensure their students have the necessary thinking skills to be successful in the global economy of the 21st century.

Comparative Perspective

North American education is often compared with that of European countries, but Japan is a better comparison. First, both Japan and Canada have reached the "universal" stage of secondary education and the "mass" stage of higher education. In 1995, the total enrollment rate in senior high school was estimated to be 85.2 percent in Canada and 95.8 percent in Japan, while the total enrollment rate in higher education was estimated at 68 percent in Canada and 45.2 percent in Japan (Statistics Canada, 1996; Monbusho, 1996, p. 18). In contrast, many European countries still have lower enrollment rates in secondary and post secondary education. Second, both Japan and Canada have comprehensive public elementary and junior high schools offering a broad-based liberal education, in contrast with Europe's selective system. Despite these similarities, Japan's institutional national system is a striking contrast to the pluralistic Canadian provincial system. Japan offers a clear example of institutional linkages between schools and workplaces. Japanese school-work linkages are regulated by the Public Employment Security Office (a national employment agency) and are based on long-term "semiformal contacts" between schools and employing firms (Okano, 1993; Rosenbaum & Kariya, 1989).

In Japan, the responsibility for engendering the healthy development of young people is shared by family, school, and the workplace. High schools and colleges take an active role in finding employment for their graduates. "In general, the interlocking, overlapping, mutually reinforcing responsibilities shared by the family, school, and company for the development of the individual is an important factor behind the success of Japanese education" (White, 1987, p. 73). Japan's high schools provide a broad academic foundation and the opportunity for students to be selective in their choice of career path. Upon graduation from junior high (grade 9), students take various high school entrance exams to determine which high school they will attend. High school entrance exams then sort each age cohort into what amounts to an eight- to ten-tier high school ranking system (Rohlen, 1983, p. 308). Future occupational and status levels (elite, managerial, blue-collar, and so forth) are closely equated to this ranking. Further, at the point of high school entrance the entire age cohort is divided into three largely immutable classificatory distinctions: those leaving school, those entering vocational ranks, and those going on to academic high schools. The ratio of students attending academic (general) high schools has been steadily increasing from 60 percent in 1970 to over 74 percent currently. The other students attend specialized vocational schools in Agriculture, Industry, Commerce, Fishery, Home Economics, Nursing and others. Since 1994, the

Monbusho has introduced comprehensive schools. Now, there is a trend toward all high schools offering a more liberal education with significantly more choices for students (Takakura & Murata, 1998, p. 29). In Japan, over 95 percent of all students are advancing to high school and nearly as many are graduating, signifying the near demise of the high school degree as a mark of distinction. The type of high school and the status of one's university were crucial measures. High schools in Japan rely on exam competition for providing discipline and foundations of learning, while leaving to universities and the workplaces the final responsibilities for deciding what additional skills and specific training are needed.

Higher Education

While parts of the Japanese education system are considered by many to be the best in the world, higher education is considered by both the Japanese and others to be seriously inadequate by international standards. The Report of the University Council in 1991 recommended vast improvements in the quality of teaching and research, in order to bring Japanese universities to the international academic level (Takakura & Murata, 1998, p. 33). The demand for excellence, so prevalent from kindergarten through senior high school, stops at the university doorstep. Consequently, the present system of higher education is not providing knowledge, skills, and the creativity needed to enable Japan to compete globally in the "information age" or to succeed in its long-range commitment to restructure its manufacturing base (Haiducek, 1991, p. 40). A salient example is found in an international comparison of Nobel Prizes (Natural Science, 1901–1995) awarded. While the U.S. with a population of over 260 million produced 175 Nobel Prizes, Canada's population of 30 million produced seven

Nobel Prizes and yet Japan's population of 125 million has produced only five Nobel Prizes (Ueda, 1997, p. 11, 109). A more recent example is the Japanese government's inability to deal with the economic recession of the 1990s. Financial experts in other G–7 countries repeatedly tried to advise the Japanese government of dangers in their fiscal management policies but to no avail. At least the Monbusho recognizes the deficiencies in Japanese higher education and, as a result, is aggressively pursuing reforms, including importing American institutions of higher education. Several American colleges and universities including MIT, Harvard and UCLA have opened branches in Japan. Through such attempts of internationalization, many Japanese see this as a means by which they will be able to compete in the global economy and be fully accepted by the rest of the world. Internationalization of education has been recognized by the Monbusho as an important area of reform.

Traditionally, higher education in Japan has functioned as a selection process used to maintain an elitist hierarchical structure. Through strict entrance quotas and use of competitive entrance examinations, admission to the top universities was limited. Nationwide, in 1980 about 40 percent of all graduates were advancing to higher education, but from the public academic high schools the rate was approximately 70 percent (Rohlen, 1983, p. 85). University enrollments increased dramatically during the 1960s and 1970s and continued in the 1980s and early 1990s with increased competition for entrance to the most prestigious institutions. According to the Monbusho (1996), higher education enrollment for high school graduates increased from a mere 10.2 percent of the age cohort in 1960, and 18.7 percent in 1970, to a substantial 33.5 percent in 1980. Although over 80 percent of high school freshmen aimed at higher education there was insufficient space for all applicants (Rohlen, 1983, p. 82). However, private universities and special training schools have absorbed increased numbers of upper secondary school graduates wishing to continue their studies and since the population "bulge" of the 1992 cohort of graduates, there has been no need for further quantitative expansions in universities (Takakura & Murata, 1998, p. 33). For individuals not going to college it has meant beginning work with a major disadvantage because they lacked the necessary credentials. Until very recently, going back to school was not an option and rarely have the most talented high school graduates gained promotion above university educated employees. However, individuals fortunate enough to be admitted into the best national universities such as Tokyo University or the exceptional private universities such as Waseda, were assured a promising career in government or business.

In recent years the Monbusho has attempted to change the elitist structure of higher education, to reform the exam-based admissions to universities, and to eliminate government and business links to the most prestigious institutions (Takakura & Murata, 1998, p. 30). However, the critical determining factor for Japanese post-secondary students is still the university entrance examinations rather than what is studied during the undergraduate degree. Japanese people fondly reminisce about the freedom from study, work and adult responsibilities they experienced as carefree university students. While North American higher education demands hard work and intense study, Japanese higher education is widely recognized and accepted as a place of rest and relaxation before facing the rigours of the workplace.

While Japan's undergraduate programs are less than satisfactory, they are relatively competent in comparison to graduate programs which have been underdeveloped and widely recognized as an area where drastic improvements must be made. On May 1995, only 68 percent of Japan's universities had a graduate school and only 49 percent offered doctoral courses (Monbusho, 1996, p. 29). While the number of universities having a graduate school in education increased from only three in 1985 to more than 43 in 1995, according to the Monbusho, demands still exist for both qualitative and quantitative improvements at graduate schools (Monbusho, 1996, p. 31; Shimahara, 1995b, p. 180). Current reform proposals seek to make graduate study in many fields more accessible, but systematic strategies for achieving this goal have not been developed (Hawley, 1990, p. 47). This remains a problem for Japan's universities, however there is some evidence of universities becoming more flexible in admissions and accommodating lifelong learning.

Despite these deficiencies in higher education, the needs of Japanese society are for more vocational training and less university graduates. The bachelor's degree is devalued as more and more receive it, yet the demand grows for more technical skills. But Japan has entered an age of mass higher education, and the trend is difficult to reverse. Japan's private sector has responded to the demand for more higher education. The result is an abundance of institutions but a lower quality of instruction.

Many Japanese post secondary institutions function outside the mainstream. A case in point is the function of colleges in Japan and the imbalance of male to female students in universities and colleges (Fujimura-Fanselow, 1993, pp. 163–165). Only recently has progress toward full equality of participation for women in higher education been realized (Takakura & Murata, 1998, p. 34). However, many females attend a junior college. Most college students will not go on to university. Junior colleges in Japan do not serve the same role as colleges in Canada or the U.S.. University transfer is not an option nor is it a goal for college graduates who enter the work force directly as secretaries and junior employees. "Two out of every three females are headed for junior colleges, whereas nine of every ten males are aiming at four-year universities... Approximately 30 percent of those students going on past high school attend junior colleges, yet 90 percent of them are female... The percentage of women in four-year universities increased from 8 percent in 1960 to 18 percent in 1980" (Rohlen, 1983, p. 85). Currently, 91.8 percent of students enrolled in Japan's junior colleges are female while only 31.2 percent of university students are females (Takakura & Murata, 1998, p. 32). Although the ratio of females enrolled in university has increased, clearly, as recognized by the Monbusho, there is a need for further reforms to Japan's higher education.

Teacher Education

Japanese teacher education is regulated by national laws established by the central government. The most important statute regulating the Japanese national system of teacher education is the Law for Certification of Educational Personnel, passed in 1849 and most recently revised in 1988. This, in conjunction with other laws, set forth the basic characteristics of Japanese teacher education. These may be briefly summarized as follows:

1. Certification and teacher training is the primary responsibility of the Monbusho.

2. The Minister of Education is advised by the Council of Teacher Education, which is composed of experts in teacher education. For major policy issues public hearings are held.

3. Each of the 47 prefectures have boards of education which issue teaching certificates valid for teaching in all prefectures.

4. New teachers are recruited by the prefectural boards of education annually from qualified teachers and teachers in training through competitive screening tests.

5. First year teachers have a one year probationary period before becoming permanent employees. During this time they must receive significant in-service training.

6. The planning of all initial and in-service training is the prefectural board of education's responsibility.

7. Universities and colleges where teacher training occurs must first be authorized by the Ministry of Education as institutions of higher learning.

(Kobayashi, 1993, pp. 5–6)

Teacher education in Japan takes the form of a united pattern. The curriculum for pre-service education at each university and college is developed within the framework of the Law for Certification of Educational Personnel. Since education is universally valued by Japanese society, teachers are highly regarded, and well paid. Half the salary of educational personnel is paid by the central government. This makes it possible for local governments to assign the necessary number of teachers without being influenced by the local financial situation. In this way, Japan has achieved its mandate for equal educational opportunity.

In order to become a teacher, one must obtain a teacher's certificate by completing the subjects in a university program for teacher education. The most common way to become a certified teacher is to complete the teacher training curricula at a Monbusho authorized junior college or university. At present there are over 800 institutions offering teacher training throughout Japan (Shimahara & Sakai, 1995). Advanced, 1st class, and 2nd class certificates are awarded for completion of Master's degrees, four year Bachelor's degrees and 2–3 year Associate degrees respectively. In order to teach elementary or lower secondary school a 2nd class certificate is required. There is no 2nd class certificate for upper secondary school teachers. To teach in upper secondary schools a 1st class certificate is required. As a result of recent reforms to teacher education, teachers holding a 2nd class must make an effort to obtain a 1st class certificate by taking 45 university credits upon completion of five years of teaching. The number of credits can be reduced according to the number of years of teaching experience. Currently, due to the increasing competition for teaching positions, most new teachers obtain a four year Bachelor's degree and 1st class certificate, yet only one-fourth of all graduates receive teaching appointments (Shimahara & Sakai, 1995). Consequently, there is a trend for teachers to attain higher degrees. According to Takakura and Murata (1998) more than 90 percent of teachers from primary school to upper secondary school have graduated from institutions of higher education (university or junior college). However, Japanese pre-service teachers take considerably fewer courses for certification compared to B.C.'s teachers. Until the recent reforms in teacher education, most prospective high school teachers in Japan took approximately 32–40 credits in their subject area, and merely 11–13 credits in pedagogical studies (Hawley, 1990, p. 38). Shimahara and Sakai add:

> The flaw of postwar teacher preparation was evident especially in the certification requirements at the secondary level that were in force until 1990: merely 14 credits of professional studies, including two credits in student teaching, equivalent to two weeks of clinical experience. Students seeking teacher certification at institutions whose primary mission was not teacher education tended to meet only the minimum requirements. These were the students who, of late, filled two-thirds of the lower secondary positions and nine-tenths of the upper secondary positions in the public school system (1995, p. 234).

However, since 1990 modest improvements have been made in the number of professional credits necessary for certification. For example, an upper secondary teacher must now obtain 40 credits in their subject area and nineteen credits in professional subjects including: essence and goals of education; teaching methods; educational guidance and counseling; and a teaching practicum (Takakura & Murata, 1998, p. 86–89). This pre-service training is still much less than the 60 credits of a four year Bachelor's degree and the equivalent of two full academic years (30 credits) of methods courses and pedagogical studies required of education students at B.C.'s universities. Also, the practicum for both Japanese and B.C. students continues to be an area where improvements are necessary.

Comparisons Between B.C. and Japanese Teachers

While Japanese teachers are expected to address all aspects of students' life at school, B.C. teachers tend to be primarily concerned with the development of cognitive competence. The role of teachers is different in each educational system and culture. In North America, teaching is considered to be an idiosyncratic profession and the common lore is that teachers can't be taught how to teach because they are born not made (Rohlen & LeTendre, 1996; cf. Stevenson & Stigler, 1992). According to Takakura and Murata (1998), the view of 'teaching as a profession' is a relatively new concept in Japan. Rather, teaching is a craft that can be perfected through practice and learned through the shared wisdom of experienced teachers. Stigler, Fernandez and Yoshida provide an excellent metaphor:

> If music were used as an analogy, the Japanese conception of the ideal teacher would be like that of the concert pianist: the great pianist is not expected to write the concerto but only to perform it well. The American teacher, by analogy, is expected not only to teach but also to write the score. An innovative teacher in the United States is one who organizes her own curriculum, makes her own materials, and implements her lessons with independent initiative. In Japan, the innovative teacher is one who skillfully teaches the lesson that is prescribed by the text (1996, p. 216).

In Japanese schools, beginners learn a great deal from experienced teachers through informal contact or *zatsudan* as well as programs of in-service training. This is often a one-way pedagogical exchange however, with little to be offered from the neophyte to the seasoned veteran mentor teacher. Therefore, it is difficult for new teaching strategies to be disseminated from universities through student teachers and eventually to become accepted by the mainstream, since it is assumed the more experienced teachers must pass down all the lessons to be learned. In British Columbia, frequently just the opposite is true. Experienced teachers learn a great deal from their student teachers—it is widely recognized as one of the best forms of professional development, since teachers do not have many opportunities for collaboration and peer consultation. Many recent developments such as criterion referenced assessment have only become a part of the repertoire of experienced teachers through interactions with students. Teachers in both B.C. and Japan tend to view learning to teach as an apprenticeship where practical knowledge learned while teaching takes precedent over theory learned in university.

The Japanese in-service training of teachers serves as a model for the enculturation of beginning teachers and has been recognized as a lesson to be learned from the Japanese educational system (Rohlen & LeTendre, 1996; Shimahara & Sakai, 1995; Stevenson & Stigler, 1992). In Japan, all newly appointed teachers undergo 20 days of intensive training at their prefectural-level in-service center prior to taking their positions. New teachers are provided with the equivalent of 125 days of professional development during their first year under the tutelage of one or more senior teachers. First year teachers in Japan now receive one year of mentoring from a specially trained master teacher (Hawley, 1990, p. 42; Takakura & Murata, 1998, p. 91). "It consists of supervised teaching by senior teachers in schools two days per week for 30 weeks, study in local education centres one day per week for 30 weeks, and residential training for 4 nights" (Kobayashi, 1993, p.10). Professional development in teaching is further enhanced by local education centres providing ongoing in-service training and "hands on" experiences for secondary specialists and elementary generalists alike. Much like the rest of Japanese professions, most of the training occurs in the workplace. Pre-service training of teachers includes a general education with professional courses in pedagogical theory, educational psychology, teaching methods as well as specialized subjects. However, the teacher education programs are characterized by courses that have little relevance to the classroom and a practicum that consists of a very short stay of only a few weeks in a school. Many previous graduates of British Columbia's teacher education programs lament similar weaknesses, but there is an important distinction; while pre-service teacher education programs in B.C. may be superior to the Japanese programs, Japanese professional development and in-service training for the beginning teacher far surpass B.C.'s "sink or swim" first year teaching experiences.

During a two year stay in Japan (1990–1992), the writer was an assistant English teacher in lower secondary schools in the Tokyo area and observed in-service and pre-service teachers of English classes. On one occasion, in the writer's grade 9 English class, a student teacher was observed at the same time he was being evaluated by his faculty advisor. The student teacher taught the same lesson, in exactly the same way, using the same style as his sponsor teacher. In fact, the entire lesson had been rehearsed previously for the benefit of the student teacher and the faculty advisor. The "performance" however, was abysmal. The student teacher appeared to be very anxious and uncomfortable in his role as a teacher. He refused to face the students. Instead he talked to the board while moving around nervously. Despite the fact that the material was not new to the students and the entire lesson was a repetition, this was the first (and last) time this student teacher taught this class. The writer later learned that most sponsor teachers would rather not have a student teacher at all, and that this one class was done merely as a show to appease the faculty advisor.

Japan's teachers recognize that the university does little to prepare student teachers for the profession of teaching and teachers do little to change the status quo. This is further illustrated in Stevenson and Stigler's *The Learning Gap:*

> The real training of Asian teachers occurs in their on-the-job experience *after* graduation from college... graduates of teacher training programs are still considered novices who need the guidance and support of their experienced colleagues... the system of teacher training is much like an apprenticeship (Stevenson & Stigler, 1992, p. 159).

This is in contrast to the experience of B.C.'s teachers, who complain that most of what they know had to be learned by themselves, alone, in isolation, while on the job. There is a serious deficiency in B.C.'s public education since there is little provision for mentorship and insufficient time to reflect on teaching practices. Teacher education is limited to pre-service training with a lack of emphasis on in-service training. This situation is less than ideal.

Educational Reforms in B.C. and Japan

While Western countries are attempting educational reforms to promote national standards and a centralized uniform system, Japan is attempting to decentralize their education and to make it more comprehensive rather than more focused. "Comparatively speaking, Japanese and American school reforms are now evolving in opposite directions. Japan is slowly diversifying its schools while the United States is trying to promote new national academic standards" (Shimahara, 1995a; Takakura, 1993). In Japan, where the central government plays a decisive role in determining policy, two diverse trends in teacher education have emerged. On the one hand, the professionalization of teachers has improved due to the increasing requirements for professional training, and on the other hand, liberalization has taken place through the addition of programs in non teaching areas.

British Columbia's reforms to teacher education have been predominately influenced by the faculty of education at each of the universities. Despite much progress in professional teacher training, criticism of faculties of education has remained quite strong (Goodson, 1995). University schools of education have tended to distance themselves from the concerns of classroom teachers, and the research agenda has not often produced knowledge useful to the practitioner. Also, there are no permanent, durable models of teacher training (Barman, Sutherland, & Wilson, 1995, p. 313). The Carnegie Report, *A Nation Prepared: Teachers for the 21st Century* (1986), the report of the Holmes Group, *Tomorrow's Teachers* (1986), and John Goodlad's, *Teachers of Our Nation's Schools* (1990), all conclude that schools/colleges/faculties of education need reform.

Perkins (1992) makes convincing arguments for reforms to pre-service and in-service teacher education. He suggests Japan's educational system offers a model for the professional development of teachers and the promotion of potent teaching practices. The key elements of Japan's model include: time to think, a shared culture of the craft of teaching, and an apprenticeship model of teacher development. Japanese teachers spend less hours per day actually teaching classes than their British Columbian counterparts. More time is devoted to thinking and reflecting about their teaching. "They plan lessons, share plans with one another, get critiques, attend workshops, observe other teachers teaching, watch videotapes of teaching practices... Through organized time and commitment, teachers can learn to teach much better than native ingenuity alone could allow" (Perkins, 1992, p. 225). Rather than working in isolation, Japan's teachers recognize the power of collaboration. This is even evident in the very physical structure of the schools. For example, the staff room is arranged with teachers of each grade level seated at desks grouped together, in order to promote daily exchanges. This is where all the teachers plan their lessons during several hours of the working day when they are not in front of the classroom. This is in direct contrast to teachers in B.C., who do most of their lesson planning at home or in the isolation of their own classroom.

Teacher Education Reforms in B.C. and Japan

Several educational reforms involving cost-saving and efficiency measures are being contemplated by the B.C. Ministry of Education. These include: year round schooling, efficiency scheduling (for example, the extended school day), and different timetables (Semester System, Copernican, Quarter System). None of these "reforms" in their current vein address the underlying problems of the education system nor do they improve student learning or teacher training. Money saved is not likely to go back into the education of young people.

Summary

Many of Japan's practices are complementary or similar to current suggested reforms to B.C.'s education system. Yet, the B.C. and Japanese models are far from perfect. Improvements must be made to the teacher education programs of Japan's universities and to the pedagogical training of pre-service teachers. This fact is widely recognized by educators in Japan. "We must pay more attention to student teaching through which a sense of mission as a teacher might arise. If the transition from pre-service preparation is not attended to, the effects of teacher improvements in education may have little influence on the quality of teaching in Japan (Mizoue & Inoue, 1993, p. 28). Through further international comparative studies, the Japanese teacher education programs can be improved. Much can be learned from British Columbia's teacher education programs. Likewise, British Columbia's training of teachers can be improved by studying Japan's apprenticeship model of in-service training and professional development. Teachers must be given opportunities to learn from one another and to benefit from the accumulated wisdom of generations of skilled practitioners. In addition, teachers must be given adequate time for collaboration, planning and reflection. The reforms of education in both British Columbia and Japan require a rethinking of the profession of teaching. Critical thinking is an essential element of these reforms, for any effort to reform the structure or organization of education ultimately depends on the effectiveness of the teacher.

CHAPTER 3

CRITICAL THINKING

The teaching of critical thinking at all levels of education has strong support in North America, the UK and elsewhere (Daniels, 1998, p.1). "The field of critical thinking is more vibrant than ever. There is much research in progress on the meaning of critical thinking, on the transferability of critical thinking skills to a wide range of subject areas, and on methods of teaching critical thinking" (Norris, 1985, p. 40).

The Components of Critical Thinking

There is debate about what is meant by the term "critical thinking." In the past, attempts to define critical thinking encompassed its form and function, including skills and strategies as well as levels of complexity involved. Often critical thinking is linked to creative thinking, problem solving and decision making as well as inductive and deductive reasoning. However, terms such as creative thinking, problem solving and decision-making refer to the circumstances in which critical thinking may occur (Daniels, 1998, p.1). Conversely, some educational philosophers argue that critical thinking is inductive, encompassing divergent and creative thinking skills. Others contend it is primarily deductive, convergent and logical in nature.

> There are certain elements that may or may not be included in a definition. One element is concerned with whether critical thinking is convergent or divergent. Another describes what the critical thinker does. A third element focuses on the attitude or disposition of the thinker. You don't usually find all three elements in every definition (French & Rhoder, 1992, p. 184).

Daniels (1998) characterizes critical thinking as a normative concept. A critical thinker is someone who is thinking well. To think well in any area of human practice one must make judgments using relevant criteria and standards. McPeck (1990), Norris, Siegel and Paul have trouble agreeing on a common critical thinking paradigm. Paul characterizes critical thinking as...

> a unique kind of purposeful thinking in which the thinker systematically and habitually imposes criteria and intellectual standards upon the thinking; taking charge of the construction of thinking; guiding the construction of thinking according to the standards while assessing the effectiveness of the thinking according to the purpose, the criteria, and the standards (1993, p. 21).

Nevertheless, Norris argues that many questions associated with critical thinking, which philosophers have attempted to answer, involve empirical issues. Since these concern the nature of human mental abilities, hypotheses should be tested empirically by researchers if there are no philosophers inclined to tackle the problem.

What then is critical thinking? How is critical thinking different from creative thinking, problem solving and other forms of thinking? Blodgett-McDeavitt's (1995) survey of adult educators found that critical thinking is perceived as a process and a broad concept, with two general components: reflective and analytical. Respondents discussed the reflective nature of critical thinking as "looking at the bigger scheme of things," "thinking about other alternatives," and "it's the idea that it's not in isolation." Respondents discussed the analytical component in terms of the "ability to do very complex reasoning (and) to think about things from different perspectives." A common element frequently included in most critical thinking literature is reasoning. Reasoning involves "the production and evaluation of arguments, the making of inferences and the drawing of conclusions, the generation and testing of hypotheses. It requires both deduction and induction, both analysis and synthesis, and both criticality and creativity" (Nickerson, 1986, pp. 1–2). Creativity requires critical thinking since... "both critical filtering and critical characterizations contribute to the creativity of a creative product. Accordingly, it is somewhat misleading to posit two completely separate styles of thought critical and creative—because the former is necessarily a part of the latter" (Nickerson, Perkins & Smith, 1985, p. 89). In addition, Paul (1993) suggests critical thinking differs from problem solving. It does not involve sequential steps but a group of skills and strategies chosen and used as needed. A working definition of critical thinking used in this thesis is essentially deeper thinking or higher order thinking.

Learning Critical Thinking

An analysis of teachers' conceptions of critical thinking must be placed within the larger framework of cognitive and educational psychology. Piaget, Kholberg, Selmen, Bloom, Vygotsky and Guilford each proposed different developmental models describing the stages of learning. All theories of cognitive development are grounded in the principles that people develop at different rates, development is relatively orderly and development takes place gradually. Piaget's cognitive development theory contains four stages: (1) sensorimotor; (2) pre-operational; (3) concrete operational and (4) formal operational. The fourth and final stage in Piaget's theory is characterized by the use of propositional thinking, combinatorial analysis, and abstract reasoning. According to Piaget, most children between the ages of eleven and fifteen are capable of reaching the formal operational stage (Inhelder & Piaget, 1958). However, Kuhn (1979) contends that many adults will never reach the formal operational stage. If this is true, then critical thinking may not be attained by everyone, as Piaget's final stage reflects higher order cognitive processes.

Kholberg's stages of moral judgement and Selman's stages of social perspective taking both parallel Piaget's cognitive stages (Muuss, 1988). The concrete operations in Piaget's model correspond to Kohlberg's preconventional level of moral development. Similarly, the shift from childhood to adolescence involves a dramatic shift from concrete to abstract thought processes and in moral judgements. The relationship between these theories is such that the attainment of Piaget's cognitive stages is a necessary precondition for the attainment of the corresponding level of Kholberg's moral judgement and Selmen's societal perspective-taking. Thus, the mastery of higher order thinking skills does not guarantee the individual has attained the same level of moral reasoning (Muuss, 1988).

Bloom's (1956) taxonomy of educational objectives from the cognitive domain consists of six levels (listed in order of complexity): (1) knowledge; (2) comprehension; (3) application; (4) analysis; (5) synthesis; and (6) evaluation. The higher order thinking skills of analysis, synthesis and evaluation are not attainable until the other lower order skills have been well developed. Therefore, critical thinking may not be a realistic learning outcome until students have demonstrated the lower order skills of knowledge, comprehension and application. Moreover, younger students and mentally challenged individuals may not be capable of critical thinking.

Whereas Piaget characterized a child's learning as a little scientist constructing an understanding of the world largely alone, Vygotsky (1978) proposed a zone of proximal development depending primarily on a child's interactions with other people within their environment. The zone of proximal development is a phase in which a child can master a task given appropriate support. Thus, children can reach their full learning potential and most can demonstrate critical thinking provided they are given the necessary scaffolding.

Guilford's (1966) Structure of Intellect (SI) theory suggests intelligence is comprised of operations, contents, and products. There are five kinds of operations (cognition, memory, divergent production, convergent production and evaluation), six kinds of products (units, classes, relations, systems, transformations and implications), and five kinds of contents (visual, auditory, symbolic, semantic, and behavioural). Thus, there are theoretically 150 different components of intelligence. Reasoning and problem solving skills (convergent and divergent operations) can be subdivided into 30 distinct abilities. Although critical thinking was not mentioned by Guilford directly, it likely constitutes a synthesis of many of these thinking abilities.

Critical thinking cannot be learned in isolation. Perhaps it cannot be taught explicitly. However, it can be integrated in all subject areas and related to the ideas students already have. A broad, holistic, and global approach to teaching critical thinking is necessary. "Critical thinking often requires imagining possible consequences, generating original approaches, or identifying alternative perspectives. Thus virtually any form of human practice can involve critical thinking" (Daniels, 1998, p. 1). Furthermore, critical thinking may have different connotations within the contexts of various nations and yet there is likely common elements to be shared. While different education systems tend to support different epistemologies, all have the same ultimate goal—to prepare students for life beyond secondary school. A common definition of critical thinking may not be shared by all. One must account for the cultural and contextual aspects of thinking as well. However, a broader definition of critical thinking should be relevant and understood by educators in both British Columbia and Japan.

Distortions of Critical Thinking in the Media

The term "critical thinking" is not well understood. It may have become a "buzzword" in education used without much thought to its meaning by many educators, politicians and the general public. Developing "critical thinking skills" is seen by some as a panacea to the ills of B.C.'s education system as illustrated by the following quotes from the *Vancouver Sun* newspaper:

> From Dilbert by Scott Adams:
> Character 1: "I teach my kids that these things are right and these things are wrong. Period. End of Story.
> Character 2: "Wouldn't that teach them to believe anything they're told without applying any **critical thinking**?"
> Character 1: "I don't think about that."
> Character 2: "Duh."
> (1997 United Feature Syndicate, Inc.)
>
> From January 25, 1999 *Vancouver Sun*, p. A10:
> The application of **critical thinking**, problem solving, analytical and communication skills is required for successful completion of courses... thereby fulfilling an important tenet of a university education—education for living and education for making a living. (John Pierce, Dean of Arts, Simon Fraser University)
>
> From June 22, 1999 *Vancouver Sun*, p. A11:
> The well-educated person can **analyze problems in a critical manner**, conduct research, make creative connections of data and when necessary, communicate and work effectively with others to find solutions. At least that is what educators tell us. (Gary Bauslaugh, former college educator and administrator)
>
> From September 4, 1998 *Vancouver Sun:*, p. E7:
> Kids today are likely to have three or four job changes in the future, unlike their parents, so they need skills around problem-solving and **critical thinking**. (Dorothy Fowler, principal, Burnaby Central Secondary School)
>
> From September 4, 1998 *Vancouver Sun*, p. E3:
> The ministry has been updating its courses since 1995. By 2000 all curricula will emphasize problem-solving and **critical thinking**, literacy and communication, team work, and information technology. (Lori Culbert)

Critical Thinking Research

Critical thinking is a topic of great importance to both Japan's and British Columbia's education systems. Although there is much interest, little data is available, since few comparative studies have been done. This is perhaps due to a recognition and appreciation of the difficulties associated with international comparative research in education. In Altbach's words, "Comparative and international education is a field without a clear research agenda, without widely accepted paradigms for research, without agreed methodologies, and without a clear hierarchy... (Nevertheless), ...comparative educators are in a position to benefit from a growing international consciousness in education in many countries" (Altbach & Tan, 1995, p. xviii). Further research is necessary on comparative education research methodologies and on such topics for comparison as current teaching strategies, independent or student centred learning, critical thinking and the role of the teacher. This will help to improve student learning. In addition, it will provide a cross-cultural and international understanding and appreciation of learning.

> Educators cannot continue to function as national practitioners. Few can stick to the old style of thinking and behaving as they once did... As it is irrelevant for any society to import a ready-made model of modernization, so it is for any to import or to export an education system. Innovation in teacher education can be most difficult. Globalism as a paradigm is still vague in shape and characteristic. However, the recent discussion about system theories show that the world is moving very slowly but steadily toward a new system. In a global age, the teaching profession should be reformed, and the ways of educating and training teachers also need to be transformed. Comparative globalism may work as a strategy for innovation in teacher education (Ochoa & Suzuki, 1993, p. 74).

Clearly, critical thinking is a fundamental concept in education that requires further research. These ideas are essential elements to the conceptual framework for this study.

CHAPTER 4

RESEARCH METHODOLOGY

This study was designed to compare and contrast British Columbia and Japanese high school teachers' conceptions of critical thinking across the dimensions of culture, subject area, experience, age and gender. To facilitate this comparison, a two part survey instrument was designed (see Appendix A for the English version and Appendix B for the Japanese version). Here is a description of the schools and teachers selected; the instrument development; the procedures used and the data preparation.

Sample

The sample consisted of 159 teachers from ten high schools in B.C. and Japan. Six schools were selected from the Lower Mainland of B.C. and four schools were chosen from the Kanto region of Japan. Of the 71 B.C. teachers surveyed there were 38 men and 33 women. Of the 88 Japanese teachers surveyed there were 75 men and 13 women. Table 1 summarizes the nature of the schools.

Table 1 Descriptions of B.C. and Japanese Schools Selected

School	Category	Average annual household income[1]	Student Enrollment[2]	Number of Teachers[2]	Teachers Surveyed
1. Queen Elizabeth	comprehensive	$ 42,600	1610	89	10
2. Enver Creek	comprehensive	$ 55,700	1320	72	27
3. Princess Margaret	comprehensive	$ 40,200	1464	80	12
4. Fleetwood Park	comprehensive	$ 60,500	1241	72	12
5. North Surrey	comprehensive	$ 55,400	1128	69	8
6. Elgin Park	comprehensive	$ 87,300	1113	61	2
7. Komaba	elite academic	¥ 5,940,000	491	46	18
8. Otsuka	general academic	¥ 7,060,000	724	44	28
9. Tsukuba	vocational	¥ 7,340,000	565	60	17
10. Sakado	comprehensive	¥ 7,700,000	478	42	25

Notes: [1]Based on 1996 Canada Census and 1999 Japanese Ward Offices data for each school's catchment area. As Komaba's students come from all over Tokyo, the number is an average for Greater Tokyo. [2]Enrollments and staffing as of September 2000.

Although the two national samples are well balanced in terms of schools chosen and teachers surveyed, it is necessary to acknowledge the differences in ethnicity, religion and SES. Japan is a far greater homogeneous society than British Columbia. There are few ethnic minorities and assimilation is the norm for the marginal groups such as Japanese born Koreans. B.C.'s ethnic pluralism and multiculturalism is in stark contrast to Japan's racial homogeneity and intolerance for others. While there are some Christians, Jews and other religions in Japan, Japanese are predominantly Buddhist and Shinto. However, they readily accept other religions in harmony with Buddhist beliefs. In fact Buddhism and Shinto are not practiced with religious fanaticism but rather are incorporated into everyday life as cultural traditions. An overwhelming majority of Japanese do not belong to any church nor do they practice any religious ceremonies other that those that are a part of their culture relating to birth, death and seasonal festivals. B.C. is predominantly Christian, however there is greater religious diversity than in Japan. In particular, The Lower Mainland has significant immigrant populations of Sikhs, Muslims, Buddhists, and other religious groups. Most people within Japanese society consider themselves middle class. The participants in this study were no different. The teachers surveyed in B.C. and Japan were predominantly middle class as were most of the parents and students from the schools surveyed (see Table 1). While there were some differences in SES among the schools, this was not a major factor in determining the representativeness of the study.

Schools

The high schools and teachers involved in this study were selected on the basis of geographic, academic and other comparative considerations. High schools of similar composition (size, student/teacher population, grade levels, socioeconomic status, age of teachers, and subjects offered) were chosen. Special schools appealing specifically to academically or vocationally inclined students were only included from Japan since these are an important part of the Japanese school system, while they are relatively insignificant in B.C.'s school system. A serious attempt was made to choose schools that were comparable and representative of each system. The collective data from all the teachers in each region represents an "average school" in nearly all respects. All the schools chosen were located in communities close to major urban centres. Yet they were neither "inner-city" nor "country" schools.

Geographically and systemically, in comparing schools, one consideration taken into account was the location of each school within their school district and region (see Figures 1–4).

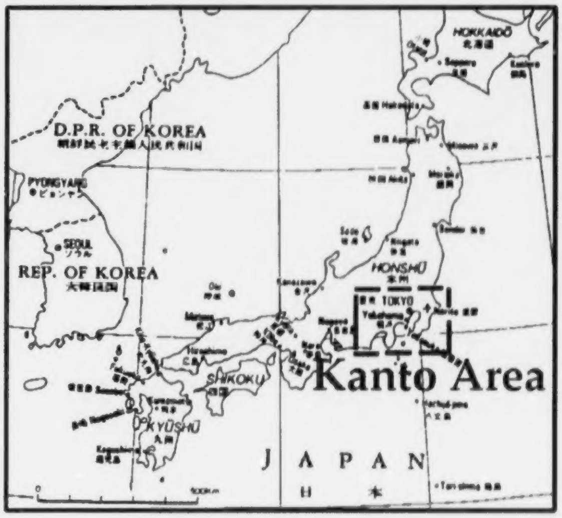
HOKKAIDO
D.P.R. OF KOREA
PYONGYANG
SEOUL
REP. OF KOREA
HONSHU
TOKYO
SHIKOKU
KYUSHU
Kanto Area
J A P A N

Figure 1. Map of Japan[1]

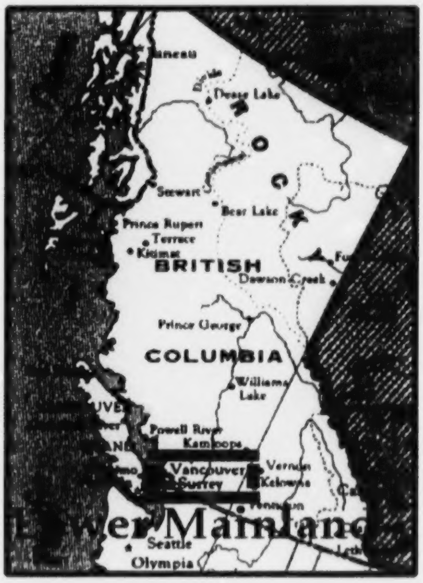
Dease Lake
Stewart
Bear Lake
Prince Rupert
Terrace
Kitimat
BRITISH
COLUMBIA
Dawson Creek
Prince George
Williams Lake
Powell River
Kamloops
Vancouver
Surrey
Vernon
Kelowna
Seattle
Olympia
Lower Mainland

Figure 2. Map of British Columbia[2]

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[1] Tokyo-A Bilingual Atlas (p. 148), 1991, New York: Kodansha. Copyright 1991 by Kodansha.

[2] Canada Map, 1997, Victoria: Davenport Maps Ltd.. Copyright 1997 by Davenport Maps Ltd.. Adapted with permission.

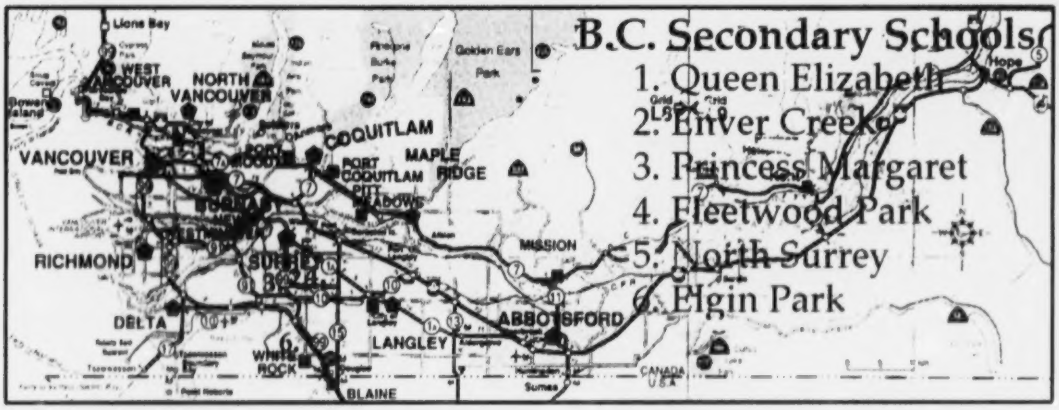
B.C. Secondary Schools
1. Queen Elizabeth
2. Enver Creek
3. Princess Margaret
4. Fleetwood Park
5. North Surrey
6. Elgin Park
Lions Bay
WEST VANCOUVER
NORTH VANCOUVER
VANCOUVER
COQUITLAM
PORT COQUITLAM
MAPLE RIDGE
RICHMOND
SURREY
DELTA
WHITE ROCK
LANGLEY
MISSION
ABBOTSFORD
BLAINE
CANADA
U.S.A.
Hope

Figure 3. Map of The Lower Mainland (Greater Vancouver)[3]

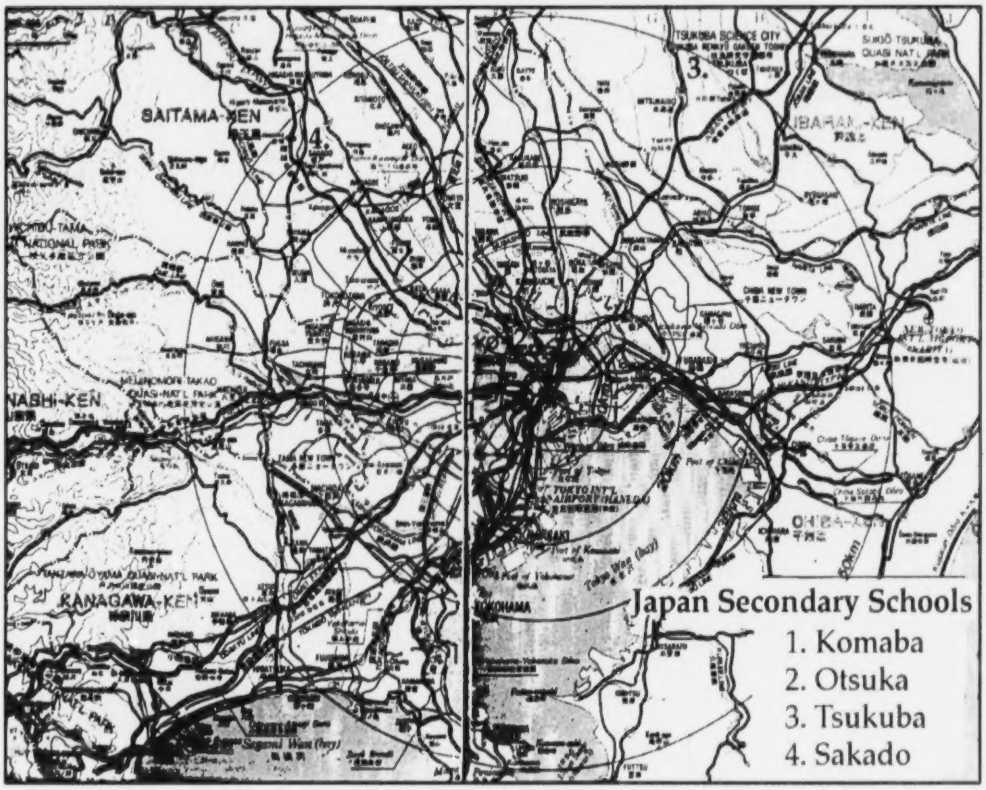
Japan Secondary Schools
1. Komaba
2. Otsuka
3. Tsukuba
4. Sakado
SAITAMA-KEN
IBARAKI-KEN
CHIBA-KEN
KANAGAWA-KEN
TSUKUBA SCIENCE CITY
TOKYO INT'L AIRPORT (HANEDA)
YOKOHAMA
KAWASAKI
Tokyo Wan (Bay)
Sagami Wan (Bay)

Figure 4. Map of Kanto Region (Greater Tokyo)[4]

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[3] B.C. Map, 1997, Victoria: Davenport Maps Ltd. Copyright 1997 by Davenport Maps Ltd.

[4] Tokyo-A Bilingual Atlas (pp. 6–7), 1991, New York: Kodansha. Copyright 1991 by Kodansha. Adapted with permission.

Two of the Japanese schools selected were located within Tokyo (Komaba and Otsuka). The Ibaraki (Tsukuba High School of Technology) and Saitama (Sakado) schools were located within the prefectures of Ibaraki and Saitama. All four schools were within the Kanto region of Japan. The six B.C. schools chosen (Queen Elizabeth, Enver Creek, Princess Margaret, Fleetwood Park, North Surrey and Elgin Park) were located within the school district of Surrey, a municipality within the Lower Mainland of B.C. In this respect, Surrey's public high schools are comparable to Ibaraki-ken's and Saitama-ken's public high schools. However, the comparison is complicated since Ibaraki and Saitama are prefectures (much like a province in Canada) with many private high schools and national high schools in addition to the prefectural public high schools. Two schools (Komaba and Otsuka) chosen were from municipalities (Meguro-Ku and Bunkyo-Ku respectively) within the city of Greater Tokyo itself. Japan's high schools offer students many choices; from schools with a special focus such as vocational training or academics to comprehensive high schools that appeal to a wide range of students with various backgrounds and goals after graduation. For this reason, the four Japanese public high schools selected were (1) academic (Komaba); (2) academic/general (Otsuka); (3) vocational (Tsukuba High School of Technology); and (4) comprehensive (Sakado), respectively in order to facilitate a comparison with B.C.'s comprehensive public high schools which are the norm. In Japan, approximately 70 percent of students attend public high schools of which over 70 percent are academic/general. The proportion of vocational high schools has been steadily decreasing to the present level of approximately 25 percent (Takakura & Murata, 1998, p. 29). In 1994, as a result of the educational reforms to the the high school curriculum, Sakado High School changed from a vocational school specializing in agriculture to a comprehensive school, offering other courses leading to different paths upon graduation. Although the trend in Japan is for high schools to become comprehensive in nature, these are few in number since it was only in 1994 that the change to comprehensive schools began to be implemented.

In addition, the nature of institutions within each education system required careful selection of suitable schools and participants. Most high schools in B.C. enrolled local students from grades 8 through 12 and did not require entrance exams. Hence, they were open to all students who resided within the catchment area of the school. On the other hand, all Japanese high schools enroll students from grades 10 through 12 and require entrance exams and, as such, may choose the most appropriate students. Therefore, it was not uncommon for high school students to travel a great distance to attend the best schools. For this reason, again academic, vocational and comprehensive Japanese high schools, enrolling local students were chosen in order to facilitate the comparison. In the selection of high schools in B.C., an attempt was made to choose high schools that were closely matched in terms of grade levels offered. For example, Queen Elizabeth Secondary School in Surrey has traditionally been a senior secondary school (grades 11–12) but at the time of the study was in transition to a full secondary school (grades 8–12). The teachers at this school had been teaching students between the ages of 15 to 18 years. This was comparable to the age of Japanese high school students which were from "kouko-no ichi-nen sei" to "san-nen sei" (grades 10–12 and ages 15 to 18 years). All schools chosen had an average population of staff and students representative of their respective school systems.

Teachers

Teachers were deliberately chosen from a variety of subject backgrounds, ages and experience. Due to the relatively small sample sizes for each group (Japanese n=88 and B.C. n=71), it was necessary to select sufficient numbers of language arts teachers, science teachers and other subject specialists as well as a range of ages and experience of teachers. Thus, possible relationships between the variables of subject area, age, teaching experience and the teachers' conceptions of critical thinking could be investigated and analyzed across the two cultures. Teachers were approached in person in the staff room or in their classroom once the Principal and school district gave approval to do so. Each teacher's subject area and their approximate age and experience was known. It was easier to obtain data from Japanese participants since their principals exercise much more power than Western counterparts. Consequently, when Japanese teachers were asked to participate by their principal most were "willing" to do so. In contrast, the B.C. teachers' participation rates were lower since they did not feel obliged to complete the survey. Since data collection from the Japanese schools was more efficient, only four schools were visited, whereas six schools were surveyed in B.C. in order to obtain a comparably sized sample. Ironically, it was more difficult to obtain data from teachers in the researcher's own school district than from the Japanese school teachers! Nonetheless, of the 159 teachers chosen, only one teacher did not agree to complete the survey. Finally, it should be noted that the researcher is not one of the teachers in the sample.

Instrument Development

Critical Thinking Cards

A list of descriptors of critical thinking (words/phrases) was derived primarily from the literature review (see in particular, McPeck, 1990; Nickerson, 1986; Nickerson, Perkins and Smith, 1985; Norris, 1985; Paul, 1993) but also from B.C. and Japanese teachers. These descriptors were then printed on index cards (see Figure 5) in a large bold-faced font (first in English and later in Japanese on the other side).

Analysis	**分析**

Figure 5. Example of a Critical Thinking Card

A card sort procedure was chosen since it was visual and tactile. This method of obtaining data allowed participants to manipulate the descriptors of critical thinking—helping to facilitate classification in a manner most appropriate to each participant. One language arts teacher actually spread all the cards out on a table and preceded to analyze them structurally and linguistically! Others preferred to cycle through the index cards like a deck of playing cards, eliminating definers as they shuffled the deck.

Translation of Critical Thinking Definers

Each critical thinking definer was double-translated for a check of accuracy and reliability. This was accomplished by consulting two Japanese individuals with backgrounds in education. The first individual (a graduate student in education at Tsukuba University, Japan) translated the English words into

Japanese. Then, the second individual (a certified teacher in Japan and a Japanese teacher currently in B.C.) translated these Japanese words back into English. All the definers from this new list were exactly the same as the original definers or were close enough that a native speaker could easily understand their meaning.

Procedures

The research reported here involved four phases spread over a period of two years.

Phase 1—Pilot Study

First, a pilot survey was conducted in order to determine the suitability of the research question to education in B.C. and Japan. During the summer of 1997, several Japanese high schools in the Kanto region (in the vicinity of Tokyo) were visited. Teachers from a variety of backgrounds, including English language specialists, graduate students in education, and university professors in educational studies, were contacted through personal references. Teachers were interviewed with the aid of an interpreter, about their conceptions of critical thinking. They were asked, "What is 'critical thinking'?" In addition, lessons were observed. Then in the fall of 1997, several high schools in B.C.'s Lower Mainland (in the vicinity of Vancouver) were visited. During these visits to high schools in B.C. and Japan, approximately twenty teachers were each asked to provide words or phrases describing "critical thinking." A list of critical thinking descriptors was thus generated from the relevant literature (British Columbia Ministry of Education, 1993; French and Rhoder, 1992; Haladyna, 1997; McPeck, 1990; Nickerson, 1986; Nickerson, Perkins and Smith 1985; Norris, 1985, 1988; Paul, 1993; Veruin, 1996) and from the input of teachers.

Phase 2—Instrument Design

Next, a list of 50 definers describing the most common teachers' conceptions of critical thinking was derived from the pilot survey. These definers were then translated into Japanese and English with a double translation for a check of reliability. Each definer was then written on an index card (English on one side and Japanese on the other; see Appendix C for a complete list). In addition, a questionnaire was designed including basic demographic information (gender, age, subject area, and years of teaching experience) as well as open-ended questions concerning teachers' conceptions of critical thinking (see Appendix A for the English version and Appendix B for the Japanese translation of the teacher questionnaire).

Phase 3—Survey of B.C. Teachers

From late June 1998 through December 1998, 71 teachers from six Surrey schools in B.C. were selected on a voluntary basis to participate in the study. They were approached individually and were asked to (1) classify the cards as relevant to critical thinking or not relevant to critical thinking and then (2) to choose the ten most significant cards and rank them 1–10. The researcher was present during the card sort procedure and the questionnaire but only to clarify the procedures. However, generally, no additional intervention or explanation was required. Any questions about the critical thinking definers were not answered with any explanation. Rather, the response was invariably, "If you are unsure about the meaning of a word, place it in the 'other' pile. Only place words that you are sure relate to critical thinking, in the critical thinking pile." Each participant's critical thinking definers chosen were tallied in a spreadsheet of all 50 critical thinking cards and then the ranking was noted (see Appendix C).

Phase 4—Survey of Japanese Teachers

In March 1999, the questionnaire/card sort was administered to 88 secondary teachers at the four high schools in the Kanto region of Japan. Japanese participants were chosen in much the same way as their B.C. counterparts, with the assistance of Dr. Tanaka from Tsukuba University in Japan. The writer's bilingual and bicultural skills proved helpful as well as the personal contacts made during previous visits to Japan.

Data Preparation and Analysis

Once the data was collected, the Japanese questionnaires were photocopied and translated into English. The answers to the open-ended questions were read, summarized and then coded as to their relevance to critical thinking. Then the quantitative data from the card sort and the demographic information was entered into SPSS. Each participant was coded by school, number and country of origin. If a respondent chose a critical thinking definer it was recorded as a "1" and if they did not choose a definer it was recorded as a "0". In addition, the top ten definers chosen and ranked were coded as shown in Table 2.

Table 2 Coding of Critical Thinking (CT) Definers Card Sort

Ranking	Code
CT definer not chosen	0
CT definer chosen but not ranked	1
#10	2
#9	3
#8	4
#7	5
#6	6
#5	7
#4	8
#3	9
#2	10
#1	11

Note: In order to facilitate the data analysis, the ranking of the top ten definers were coded such that a definer ranked #1 was entered into SPSS as an '11'. Thus, definers that were considered less important were given sequentially smaller numerical values.

Separate fields were used for gender, age, teaching subject, number of years teaching and the responses to "Is critical thinking part of the curriculum for your subject area?" and "Is critical thinking taught in your classroom?" Next, the critical thinking data was transformed and new variables were introduced so that there was a copy of the data that showed all definers chosen as relevant to critical thinking as "1" and those not chosen as "0." In other words, if a non-zero number was in a cell for critical thinking definers it was transformed into a "1" meaning "chosen." Finally, using the SPSS data file the variables age and teaching experience were grouped into decades and five year intervals respectively in order to facilitate the analysis. The rationale for this is that novice teachers likely have different ideas than veteran teachers. From the writer's perspective and in discussions with those surveyed, teachers go through a series of phases: (1) acculturation (1–4 years); (2) growth as a new professional (5–9 years); (3) establishing routines and firm teaching philosophy (10–14 years); and (4) either maintaining the status quo or embracing new teaching strategies (15+ years). Thus, it seemed natural to investigate age and teaching experience with these groupings in addition to the characteristics of gender and subject areas.

Summary

The sample consisted of 159 teachers from six B.C. high schools and four Japanese high schools. Teachers were chosen from a variety of subject backgrounds, ages and experience. The research involved four phases spread over a period of two years. First, a pilot survey was conducted in order to determine the suitability of the research question to education in B.C. and Japan. Next, a list of 50 definers describing the most common teachers' conceptions of critical thinking was derived from the pilot survey and literature review. Each critical thinking definer was then double-translated for a check of accuracy and reliability. From late June 1998 through December 1998, 71 teachers from six Surrey schools in B.C. were selected on a voluntary basis to participate in the study. In March 1999, the questionnaire/card sort was administered to 88 secondary teachers at the four high schools in the Kanto region of Japan. The nature of critical thinking was examined as teachers interpreted it. The data obtained from the card sort/questionnaire was used to investigate the overall sense of what secondary school teachers believed critical thinking to entail and to compare B.C. and Japanese teachers' conceptions of critical thinking. Finally, the questions posed were—do teachers' conceptions of critical thinking vary as a function of subject area, gender, age and teaching experience?

CHAPTER 5

RESULTS–CHARACTERISTICS OF RESPONDENTS

B.C. and Japan were chosen for this comparative study for several reasons: (1) both have reached the stages of universal secondary education and mass higher education; (2) educators in each region have begun to analyze the nature of critical thinking; (3) there is considerable interest in reforms to teacher education in both regions; and (4) as they are both on the Pacific Rim and share commonalities (varied climates and geography and economies relying on exports through shipping), they are ideal for a comparative study. B.C. was chosen instead of Canada since provinces have different education systems while Japan has a highly uniform education system.

In addition to teachers' conceptions of critical thinking, the data collected included gender, age, years of teaching experience and teaching subject, as well as other information regarding teachers' values. Some of the data (see Appendix A Survey questions 5–7) may be used in further studies and is not discussed at length in this thesis. Table 3 summarizes the characteristics of the B.C. and Japanese teachers surveyed.

Gender

As shown in Table 3, of the 159 teachers surveyed, the number of men (n=113) was greater than the number of women (n=46). While the number of B.C. men (n=38) and women (n=33) teachers surveyed were nearly equal, 85 percent of Japanese teachers surveyed were men. However, these demographics are characteristic of high schools—especially in Japan. At the time of the study, only 24 percent of secondary school teachers in Japan were female while in B.C. the number was 41.4 percent (Monbusho, 1997; BCTF, 1998).

Table 3
Characteristics of Selected Teachers in B.C. and Japanese High Schools

	n	%	n	%	n	%	t value	t-prob
Gender	**Total**		**B.C.** [1]		**Japan** [1]			
Women	46	28.9	33	46.0	13	15.0		
Men	113	71.1	38	54.0	75	85.0		
Total	159	100.0	71	44.7 [2]	88	55.3 [2]	4.65	0.000
Age								
20–29 years old	22	13.8	15	21.1	7	8.0		
30–39 years old	51	32.1	22	30.0	29	33.0		
40–49 years old	49	30.8	18	25.4	31	35.2		
50+ years old	37	23.3	16	22.5	21	23.9		
	Mean	S.D.	Mean	S.D.	Mean	S.D.		
Total	41.40	9.55	39.59	10.10	42.85	8.92	2.17	0.032
Teaching experience	n	%	n	%	n	%		
< 5 years	27	17.0	20	28.2	7	8.0		
5–9 years	19	11.9	13	18.3	6	6.8		
10–14 years	26	16.0	8	11.3	18	20.5		
15–19 years	32	20.1	9	12.7	23	26.1		
20–24 years	19	11.9	6	8.5	13	14.8		
25–29 years	18	11.3	10	14.1	8	9.1		
30–34 years	14	8.8	5	7.0	9	10.2		
35 or more years	4	2.5	0	0.0	4	4.5		
	Mean	S.D.	Mean	S.D.	Mean	S.D.		
Total	15.93	9.90	13.11	10.30	18.20	9.01	3.33	0.001
Subject Areas	n	%	n	%	n	%		
Language Arts	24	15.1	13	18.3	11	12.5		
Math	23	14.5	13	18.3	10	11.4		
Science [3]	32	20.1	19	26.8	13	14.8		
Social Studies	19	11.9	9	12.7	10	11.4		
Fine Art	8	5.0	3	4.2	5	5.7		
Foreign Languages	15	9.4	5	7.0	10	11.4		
Other [3]	38	23.9	9	12.7	29	33.0		

[1] Percent by column.

[2] Denotes a percent of the total sample.

[3] Denotes pairs of groups significantly different in terms of the number of teachers in Science and Other subject areas using a Multiple Range Test at the .050 level.

Age

Both B.C. and Japan's teaching populations are aging. With new, younger teachers replacing those retiring, it is not surprising that 45.9 percent of the teachers surveyed were in their twenties and thirties while 23.3 percent were in their fifties and sixties (see Table 3). The mean age of secondary school teachers in this study was 42.85 years old for Japan and 39.59 years old for British Columbia. These statistics compare well with the latest data available from the Monbusho and B.C. Ministry of Education giving the average ages as 41.6 and 43.0 (including administrators) respectively (British Columbia Teachers' Federation, 1998; Monbusho, 1997). Japanese teachers are proportionally older than B.C. teachers—both in this sample and in the teaching population as a whole.

Teaching Experience

Japanese teachers had more career experience (x=18.2 years) than B.C. teachers (x=13.1 years). This five year difference was statistically significant ($t=3.33$, $p<.001$). While teaching experience and age were related, some teachers started teaching directly after university (especially in Japan), while many others began teaching careers much later in life. Table 3 compares B.C. and Japanese teachers' career experience, their mean ages and respective age ranges. Irrespective of culture, over half the teachers surveyed were in their thirties, yet this age group may have a wide range of teaching experience. If someone were to enter teaching directly after completing school, without any break in their studies, they would have ten years of teaching experience by the time they were in their early thirties. However, only 24 percent of the B.C. teachers were veterans, having 10–19 years of teaching experience compared to 41 percent of Japanese teachers. At any given age, Japanese teachers were likely to have more career experience than B.C. teachers. This is because Japanese teachers tend to begin university at age 18 and then go straight into teaching upon graduation. By the time a teacher is in their mid-thirties they have at least ten years of career experience.

Subject Areas

Teachers in Language Arts (24), Math (23), Science (32), Social Studies (19), Fine Arts (8) and Foreign Language (15) represented approximately 75 percent of the respondents. A number of subject areas less frequently identified were placed into the category "Other" in Table 3. These included seven B.C. subjects: Business Education (3); Computer Science (3); Industrial Education (5); Special Education (3); Counseling (1); Career Education (1); Learning Assistance (1) and six Japanese subjects: Agriculture (6); Home Economics (4); Technology Education (5); Architecture (2); Metalwork (1); Nursing (2). The specialization of Japanese subject areas is due to the selective nature of Japanese academic and vocational high schools, while the diversity of B.C. subject areas is the result of B.C.'s comprehensive high schools.

Overall, there were no major differences between the two cultures in the numbers of teachers representing the various subject areas. However, there were proportionally more B.C. "Science" teachers (26.8 percent) than Japanese "Science" teachers (14.8 percent). Also, proportionally more Japanese teachers (33.0 percent) were in the "Other" category than B.C. teachers (12.7 percent).

Summary

Japan's high school teachers were predominantly men, while in B.C. there were only slightly more men than women teaching high school. In general, Japanese teachers are older and more experienced than their B.C. counterparts. The teachers in this sample reflected these characteristics of gender, age and experience. The Japanese teachers surveyed represented a somewhat greater diversity and specialization of subject areas compared to the B.C. teachers, as evidenced by the greater number of people teaching "Other" subjects such as "Agriculture," "Architecture" and "Technology Education." Also, there were proportionally more "Science" teachers surveyed in British Columbia.

CHAPTER 6

RESULTS–CRITICAL THINKING

The purposes of this study were (1) to obtain an overall sense of what secondary school teachers believed critical thinking to entail; (2) to compare and contrast B.C. and Japanese secondary teachers' conceptions of critical thinking; (3) to investigate the nature of B.C. and Japanese secondary teachers' conceptions of critical thinking with respect to gender, age, teaching experience and subject taught; and (4) to determine whether critical thinking is a significant part of B.C. and Japanese teaching and the curriculum at the secondary level. In order to achieve these goals, 159 B.C. and Japanese teachers were surveyed using a questionnaire consisting of demographic and open-ended questions as well as a card sort procedure. Fifty definers of critical thinking, derived from the literature review and from teachers in the pilot study were double-translated and then printed on index cards (in English on one side and Japanese on the other). Teachers were asked to indicate which definers were relevant to critical thinking.

Definers of Critical Thinking

Table 4 shows the extent to which teachers in B.C. and Japan endorsed each of the definers of critical thinking, sorted in descending order. Chosen by 75 percent of the teachers, "Analysis" was the most frequently mentioned. The top five definers: "Analysis," "Reasoning," "Drawing inferences," "Problem solving" and "Analytical skills" were each selected by over two-thirds of the teachers. Rounding out the top ten were five definers chosen by over 60 percent of the teachers: "Inductive reasoning," "Creative thinking," "Clarifying ideas," "Logical" and "Thoughtful judgements." It was not surprising that these definers

Table 4
Differences in Fifty Definers of Critical Thinking between Teachers in B.C. and Japanese High Schools

	Mean	SD	Mean	SD	Mean	SD	t value	p-prob.
Definers of Critical Thinking	Total		B.C.		Japan			
Analysis	.75	.43	.83	.38	.69	.46	-2.02	.05
Reasoning	.72	.45	.85	.36	.63	.49	-3.16	.00
Drawing inferences	.71	.45	.79	.41	.65	.48		
Problem solving	.70	.46	.90	.30	.53	.50	-5.43	.00
Analytical skills	.70	.46	.85	.36	.59	.49	-3.61	.00
Inductive reasoning	.64	.48	.73	.45	.56	.50	-2.22	.03
Creative thinking	.64	.48	.62	.49	.66	.48		
Clarifying ideas	.64	.48	.61	.49	.67	.47		
Logical	.62	.49	.59	.50	.66	.48		
Thoughtful judgements	.62	.49	.62	.49	.61	.49		
Evaluating assumptions	.62	.49	.75	.44	.52	.50	-2.95	.00
Objective	.60	.49	.42	.50	.75	.44	4.42	.00
Intellectual challenges	.60	.49	.56	.50	.63	.49		
Independent thinking	.60	.60	.65	.48	.57	.50		
Hypothesize	.59	.49	.70	.46	.50	.50	-2.64	.01
Higher order thinking	.59	.49	.77	.42	.44	.50	-4.46	.00
Rational thinking	.58	.50	.64	.49	.53	.50		
Drawing conclusions	.58	.49	.75	.44	.45	.50	-3.86	.00
Deductive reasoning	.58	.50	.76	.43	.43	.50	-4.39	.00
Constructive skepticism	.58	.50	.66	.48	.51	.50		
Investigate	.55	.50	.68	.47	.45	.50	-2.85	.01
Open-minded	.53	.50	.55	.50	.51	.50		
Synthesis	.50	.50	.68	.47	.36	.48	-4.09	.00
Identifying/removing bias	.47	.50	.65	.48	.32	.47	-4.29	.00
Decision making	.45	.50	.70	.46	.25	.44	-6.38	.00
Discovery learning	.44	.50	.39	.49	.47	.50		
Divergent thinking	.42	.50	.63	.49	.25	.44	-5.25	.00
Convergent thinking	.41	.49	.46	.50	.36	.48		
Evaluation	.40	.49	.46	.50	.34	.48		
Taking ownership	.38	.49	.30	.46	.45	.50	2.06	.04
Self-directed	.35	.48	.27	.45	.41	.49		
Depth	.35	.48	.38	.49	.33	.47		
Consistency	.35	.48	.18	.39	.48	.50	4.05	.00
Metacognitive skills	.34	.48	.52	.50	.20	.40	-4.54	.00
Active participation	.34	.48	.34	.48	.34	.48		
Socratic questioning	.33	.47	.41	.50	.26	.44	-1.98	.05
Relevance	.32	.47	.45	.50	.22	.41	-3.24	.00
Specificity	.31	.46	.21	.41	.39	.49	2.41	.02
Significance	.31	.46	.41	.50	.23	.42	-2.49	.01
Clarity	.31	.47	.37	.49	.27	.45		
Student-centred	.28	.45	.31	.47	.25	.44		
Fairness	.28	.45	.07	.26	.45	.50	5.86	.01
Accuracy	.28	.45	.21	.41	.33	.47		
Responsible	.26	.44	.17	.38	.33	.47	2.32	.02
Subjective	.25	.44	.21	.41	.28	.45		
Precision	.24	.43	.18	.39	.28	.45		
Adequacy	.18	.39	.01	.12	.32	.47	5.33	.00
Cooperative learning	.16	.37	.21	.41	.13	.33		
Disciplined	.13	.33	.18	.39	.08	.27		
Completeness	.13	.34	.04	.20	.20	.41	3.07	.00
Total Words Endorsed	22.72	1.02	24.69	8.74	21.14	1.73	-2.25	.03

Note: Data is derived from critical thinking definers chosen from a deck of 50 critical thinking cards. (n=158) were chosen more frequently since they describe the the sorts of higher order cognitive skills and processes teachers associate with thinking critically.

"Analysis" was chosen most often because perhaps it best encompasses the nature of critical thinking in the classroom. Analysis means to examine something carefully, to break it into its constituent elements and to make thoughtful judgements in order to come to some conclusion (Bloom, Englehart, Furst, Hill, & Krathwohl, 1956). Analysis is used in nearly all subject areas. Math teachers encourage their students to analyze a geometry problem for possible paths to a solution. Science teachers have students analyze data in search for a pattern or relationship. Language teachers ask students to analyze a piece of literature and to summarize what they've read in a précis. Even fine arts teachers use a form of analysis when they ask students to critique a major piece of artwork or performance. Another reason that "Analysis" may have been so popular is that it is mentioned as an important component of critical thinking in most books on teaching pedagogy. In addition, teachers are well versed in Bloom's taxonomy which includes analysis as a higher order cognitive skill.

"Reasoning" is another word frequently mentioned in the literature on critical thinking. Teachers chose this word because it is familiar and encompasses much of the same aspects of critical thinking that analysis does. "Inductive reasoning" was more popular than "Deductive reasoning." Other words in the top ten also reflected this trend toward constructivism. "Drawing inferences" and "Creative thinking" both support a more inductive, self-discovery approach to learning. Thus, it would appear most teachers in this study embraced the modern concept of the "teacher as facilitator" as opposed to the "teacher as transmitter of knowledge."

Many of the definers most frequently selected by teachers were linked.

"Thoughtful judgements" could be deemed a part of "Analysis" and "Logical" is a part of "Reasoning." "Problem solving" encompasses a wide range of critical thinking skills including "Clarifying ideas." All these concepts may be a part of critical thinking in some context of learning.

Fourteen definers were chosen by fewer than one-third of the teachers surveyed: "Completeness," "Disciplined," "Cooperative learning," "Adequacy," "Precision," "Subjective," "Responsible," "Accuracy," "Fairness," "Student-centred," "Clarity," "Significance," "Specificity" and "Relevance." Although most of these concepts appear in the critical thinking literature, they were not popular choices among the teachers surveyed. Perhaps they do not describe what classroom teachers believe are the essential components of thinking critically. While they all describe positive student attributes or favourable circumstances under which learning can occur, their meaning is largely embedded in behavioural objectives rather than cognitive processes or learning outcomes.

"Cooperative learning," was found to be of little relevance to critical thinking—although a popular teaching style in both B.C. and Japan it was only endorsed by sixteen percent of teachers. This served as a reliability check. It suggests that teachers did not simply choose popular "buzzwords" or vocabulary that were most familiar to them. "Cooperative learning" was included as a distracter and is not typically referred to in critical thinking literature.

Some words commonly referred to in the literature are not part of most teachers' vocabulary. This is especially true of the older more experienced teachers and in particular of Japan's teachers. For example, "Metacognitive skills" and "Socratic questioning" were only selected by approximately one-third of the teachers, however these strategies are often used in both the humanities and sciences without teachers being aware of the formal words used to describe them.

In the open-ended section of the questionnaire, several teachers commented on the use of questioning and concept-mapping as tools to foster critical thinking, yet they did not select "Socratic questioning" or "Metacognitive skills" which describe each of these teaching strategies respectfully.

Differences Between B.C. and Japanese Teachers

While many similarities existed between the critical thinking definers selected by Japanese and B.C. teachers, there were statistically significant differences for 27 of the 50 definers (see Table 5 under Culture). Fourteen definers were significantly different at the $p<.001$ level: "Problem solving," "Analytical skills," "Objective," "Higher order thinking," "Drawing conclusions," "Deductive reasoning," "Synthesis," "Identifying/removing bias," "Decision making," "Divergent thinking," "Consistency," "Metacognitive skills," "Fairness" and "Adequacy." A number of these definers showed a marked contrast: "Decision making" was chosen by 70 percent of the B.C. teachers but only 25 percent of the Japanese teachers; "Divergent thinking" was chosen by 63 percent and 25 percent respectively. Moreover, B.C. teachers were more likely to have chosen "Problem solving," "Analytical skills," "Higher order thinking," "Drawing conclusions," "Deductive reasoning," "Synthesis," "Identifying/removing bias," and "Metacognitive skills." Japanese teachers on the other hand, were more likely to have selected "Objective," "Consistency," "Fairness" and "Adequacy." While "Fairness" was selected by 45 percent of the Japanese teachers, only seven percent of the B.C. teachers endorsed it. These definers describe behaviour and morality—concepts that are emphasized in Japan's schools. Thus, while B.C. teachers may have related critical thinking more to the cognitive domain, Japanese teachers tended to favour the affective domain.

Table 5
Correlations Between Fifty Definers of Critical Thinking and Seven Characteristics of Teacher Demographics

Correlations: Definers of Critical Thinking	Culture	Gender	Age	Teaching Experience	CT in Curriculum	CT Taught	CT Total
Accuracy	-.13	.08	.12	.12	-.06	.02	.35**
Active participation	.00	-.22*	-.14	-.16	.03	.05	.37**
Adequacy	-.39**	.01	.00	-.02	-.13	-.71	.39**
Analysis	.16	-.11	-.10	-.15	-.02	.07	.45**
Analytical skills	.28**	-.05	-.08	-.15	.11	.13	.46**
Clarifying ideas	-.07	-.01	.00	-.05	.08	.13	.51**
Clarity	.10	-.02	.01	-.07	.05	.10	.47**
Completeness	-.24*	.04	.05	.05	-.09	-.02	.33**
Consistency	-.31**	.06	.04	.07	-.11	-.15	.30**
Constructive skepticism	.15	-.04	-.17	-.22*	.05	.13	.44**
Convergent thinking	.10	-.01	.05	.04	-.02	.09	.45**
Cooperative learning	.12	-.06	-.16	-.16	-.01	.06	.42**
Creative thinking	-.04	-.10	.05	.01	.05	-.05	.41**
Decision making	.45**	-.20	-.20	-.26**	.14	.16	.44**
Deductive reasoning	.33**	-.01	-.05	-.12	.06	.26*	.44**
Depth	.05	-.11	-.09	-.13	-.08	.04	.51**
Disciplined	.16	-.09	-.07	-.09	.10	.09	.27**
Discovery learning	-.08	-.02	-.09	-.10	.08	-.02	.44**
Divergent thinking	.39	-.07	-.09	-.13	.11	.18	.38**
Drawing conclusions	.29	-.14	.00	-.05	.15	.07	.54**
Drawing inferences	.15	-.16	.06	.03	.03	.00	.52**
Evaluating assumptions	.23	-.12	-.18	-.23*	.10	.19	.47**
Evaluation	.13*	-.19	-.16	-.19	.00	.00	.38**
Fairness	-.42**	.09	-.07	-.04	-.08	-.21*	.26**
Higher order thinking	.34**	-.22*	-.23*	-.30**	.10	.17	.43**
Hypothesize	.21*	-.05	-.08	-.15	.05	.17	.63**
Identifying/removing bias	.33**	-.21*	-.16	-.22*	.09	.11	.53**
Independent thinking	.08	-.15	-.04	-.04	.14	.10	.42**
Inductive reasoning	.18	.07	.02	.01	.06	.12	.48**
Intellectual challenges	-.07	-.01	-.04	-.05	-.02	-.07	.42**
Investigate	.22*	-.21*	-.15	-.22*	.11	.15	.50**
Logical	-.07	.02	.03	-.01	-.16	-.06	.39**
Metacognitive skills	.34**	-.18	-.20	-.27**	.18	.27**	.43**
Objective	-.33**	.11	.07	.09	-.13	-.20	.26*
Open-minded	.04	-.10	-.03	-.07	.00	.00	.39**
Precision	-.12	.13	.14	.08	-.09	.00	.46**
Problem solving	.40**	-.09	-.16	-.22*	.16	.15	.42**
Rational thinking	.10	-.10	-.03	-.09	-.02	.07	.52**
Reasoning	.24*	-.12	-.06	-.08	.04	.24*	.49**
Relevance	.25*	-.16	-.11	-.15	.16	.15	.47**
Responsible	-.18	.06	.03	.01	.03	-.04	.34**
Self-directed	-.15	.06	-.12	-.13	.02	-.01	.30**
Significance	.20	-.08	-.14	-.20	.07	.22*	.47**
Socratic questioning	.16	.06	.00	-.05	.04	.15	.50**
Specificity	-.19	.07	-.13	-.14	-.08	-.08	.49**
Student-centred	.07	-.04	-.19	-.22*	.13	-.02	.37**
Subjective	-.08	.05	-.1	-.06	-.02	-.02	.37**
Synthesis	.31**	.00	.00	-.04	.10	.34**	.50**
Taking ownership	-.16	-.07	-.13	-.14	.03	.01	.31**
Thoughtful judgements	.01	-.08	-.02	-.06	.10	.06	.46**

*p<.01 **<.001

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These sorts of contrasts between Eastern and Western thinking are well documented (Cummings & Altbach, 1997; Lewis, 1995; Gardner, 1989; Reid, 1999; Rohlen & LeTendre, 1996; Shields, 1993; Shimahara & Sakai, 1995; Stern, 1995; Stevenson & Lee, 1995; Stevenson & Stigler, 1992). The data in this study reflected this to some degree (see Chapter 7 for a full discussion).

Six definers significantly differentiated the two cultures at the p<.01 level. B.C. teachers were more likely to chose "Reasoning," "Evaluating assumptions," "Hypothesize," "Investigate," and "Relevance" while Japanese teachers were more likely to have selected "Completeness." It would appear that B.C. teachers' conceptions of critical thinking correlated with cognitive processes while Japanese teachers conceptions of critical thinking correlated with more concrete learning outcomes associated with behavioural objectives.

In addition, seven other definers showed significant differences based on a t-test: "Analysis," "Inductive reasoning," "Taking ownership," "Socratic questioning," "Specificity," "Significance" and "Responsible." B.C. teachers were more likely to have chosen "Analysis," "Inductive reasoning," and "Socratic questioning." Japanese teachers were more likely to have selected "Taking ownership," "Specificity" and "Responsible." These results further illustrate differences in the nature of Eastern and Western thought within the context of Japanese and B.C. high school teachers' conceptions of critical thinking.

Differences Based on the Total Number of Definers Chosen

As shown in Table 4, the difference in the number of definers chosen by B.C. and Japanese teachers is small but statistically significant, as the mean number of definers chosen was approximately 25 for the B.C. teachers and 21 for the Japanese teachers (t=-2.25, p<.03). More than a few teachers chose only ten words while one chose all 50. It is quite likely that these individuals either misunderstood the instructions (confusing the ranking of the top ten words with the sorting procedure such that only 10 cards were chosen) or deliberately chose an easier way to complete the task. Some teachers took only 10 minutes to complete the survey while others laboured for as long as half-an-hour. Therefore, the quality of answers from teachers' responses to the open-ended questions was taken into account in addition to the quantitative results from the card-sort procedure.

Differences Based on Gender

As shown in Table 5, only four definers of critical thinking were significantly related to gender. "Higher order thinking," "Investigate," "Identifying/removing bias" and "Active participation" were significantly different (p<.01) from the other definers. Women were more likely to choose each of these.

Differences Based on Age

"Higher order thinking" was the only definer significantly related (p<.01) to age (see Table 5). Younger teachers tended to choose this word more frequently than their older colleagues. This is likely due to the recent introduction of "Higher order thinking" to teacher education. This term was not used commonly until the 1980s.

Differences Based on Career Experience

As shown in Table 5, nine definers were significantly related to career experience. Three were significantly different at the p<.001 level: "Decision making," "Higher order thinking" and "Metacognitive skills." Six definers were significantly different at the p<.01 level: "Constructive skepticism," "Evaluating assumptions," "Identifying/removing bias," "Investigate," "Problem solving" and "Student-centred." All of these definers were more likely to be chosen by teachers with less career experience. This is probably due to less experienced teachers being recent graduates of teacher education programs where teaching strategies employing these concepts are emphasized.

Relationships Based on Critical Thinking in the Curriculum

In addition to providing socio-demographic information, teachers were asked to complete several questions in the questionnaire requiring them to reflect on whether critical thinking was part of their school's curriculum or part of their classroom's agenda (see Appendix A, Questions 9–11). There was no significant relationship between the definers chosen by teachers and their response to the question, "Is critical thinking part of the curriculum in your subject area?"

Relationships Based on Critical Thinking in Teaching

As shown in Table 5, six definers were significantly related to teachers' response to the question, "Do you teach critical thinking?" Teachers who chose "Deductive Reasoning," "Metacognitive Skills," "Reasoning," "Significance" and "Synthesis" were more likely to answer "yes" to the question, while teachers who chose "Fairness" tended to answer "no." While "Metacognitive skills"and "Synthesis" were statistically most significant (p<.001), "Deductive reasoning," "Fairness," "Reasoning" and "Significance" were significantly different at the p<.01 level.

Distinguishing B.C. from Japanese Teachers

Table 6 shows the 27 statistically significant (p<.001) definers of critical thinking that distinguish between B.C. and Japanese teachers, listed in order of their discriminating power. The first definer to enter the equation was "Decision making" followed by "Fairness."

Table 6
Critical Thinking Definers that Significantly Distinguished Between B.C. and Japanese Teachers

Critical Thinking Definer	Wilks' Lambda
Decision making	.79
Fairness	.61
Higher order thinking	.54
Adequacy	.48
Synthesis	.44
Reasoning	.42
Clarifying ideas	.39
Identifying/removing bias	.38
Objective	.36
Intellectual challenges	.34
Analytical skills	.33
Completeness	.32
Disciplined	.30
Consistency	.28
Accuracy	.28
Active participation	.27
Discovery learning	.26
Problem solving	.25
Convergent thinking	.24
Student-centred	.24
Specificity	.24
Cooperative learning	.24
Socratic questioning	.23
Metacognitive skills	.23
Deductive reasoning	.23
Analysis	.22
Evaluation	.22

These 27 definers of critical thinking correctly classified 96.9 percent of the teachers surveyed as B.C. or Japanese. Table 7 shows the extent to which the single canonical discriminant function successfully determined which respondents were from B.C. and which were from Japan. The distribution of respondents is shown in Figure 6. There is a clear pattern differentiated. While B.C. teachers tended to choose "Decision making," "Problem solving," "Divergent thinking," "Metacognitive skills," "Higher order thinking," "Deductive reasoning," and "Identifying/removing bias," Japanese teachers tended to chose "Fairness," "Adequacy," "Objective," "Consistency," "Completeness," Precision," and "Specificity." The canonical discriminant function is a variable like an unrotated factor. Figure 6 shows the distribution of B.C. and Japanese teachers along this uni-dimensional variable, called the index of cultural differentiation about critical thinking. The numbers along the x-axis are essentially z-scores along this dimension of critical thinking in which the centre of all the teachers is zero and each unit is one standard deviation away from zero. On average B.C. teachers had an index of cultural differentiation $C_b = 2.07$ while Japanese teachers had $C_j = -1.67$. Thus, B.C. and Japanese teachers were 3.74 standard deviations apart on this dimension of critical thinking.

Table 7
Accuracy of Discriminant Function Distinguishing B.C. and Japanese Teachers

Predicted Group Membership		Actual Group Membership		
		B.C.	Japan	Total
B.C.	Count	70.0	1.0	71.0
	% of Teachers from:	98.6	1.4	100.0
Japan	Count	4.0	84.0	88.0
	% of Teachers from:	4.5	95.5	100.0
Total	Count	71.0	88.0	159.0
	% of Teachers from:	100.0	100.0	100.0

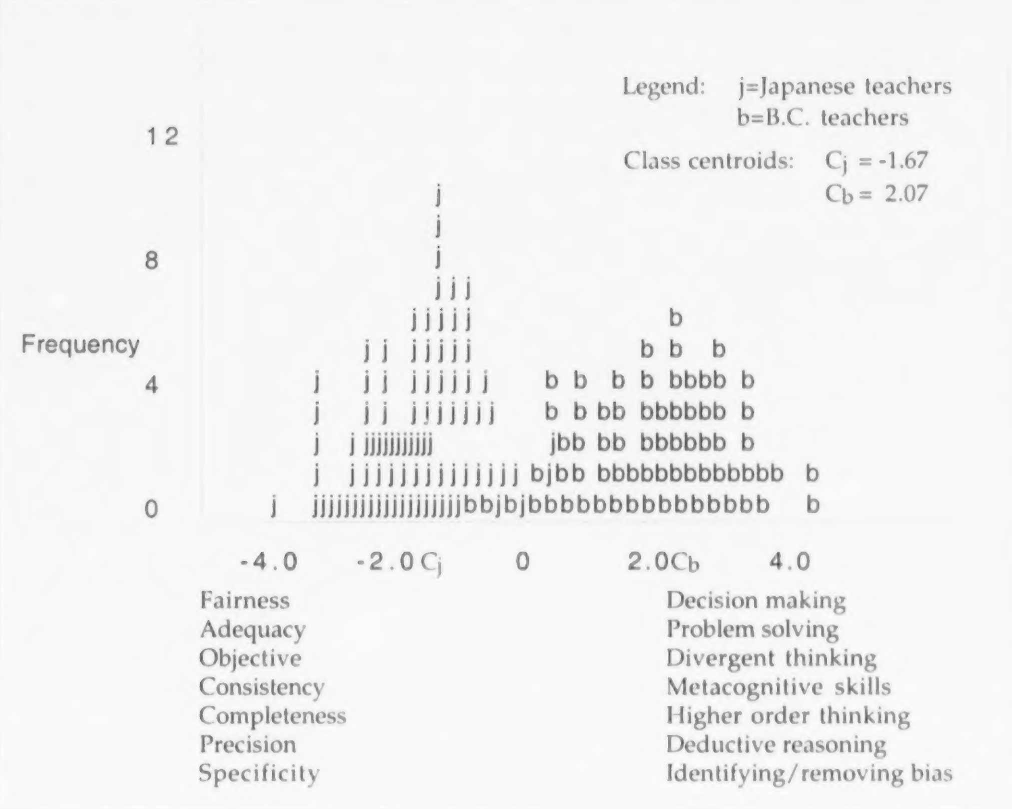

Figure 6. Distribution of Respondents on the Single Canonical Discriminant Function of Significant Critical Thinking Definers

Ranking Selected Definers of Critical Thinking

In addition to selecting or not selecting definers, teachers were asked to choose the ten that were most significant to critical thinking. A broader scope to their views can be obtained by investigating the ranking of the top ten definers (see Figure 7). While "Fairness" was ranked in the top ten by 22.7 percent of Japanese teachers, it was ranked by only 1.4 percent of B.C. teachers. Other definers were chosen much more frequently by Japan's teachers. For example, "Objective" was chosen by 75 percent and ranked in the top ten by 59.1 percent of Japanese teachers whereas only 42 percent of the B.C. teachers chose it and 9.9

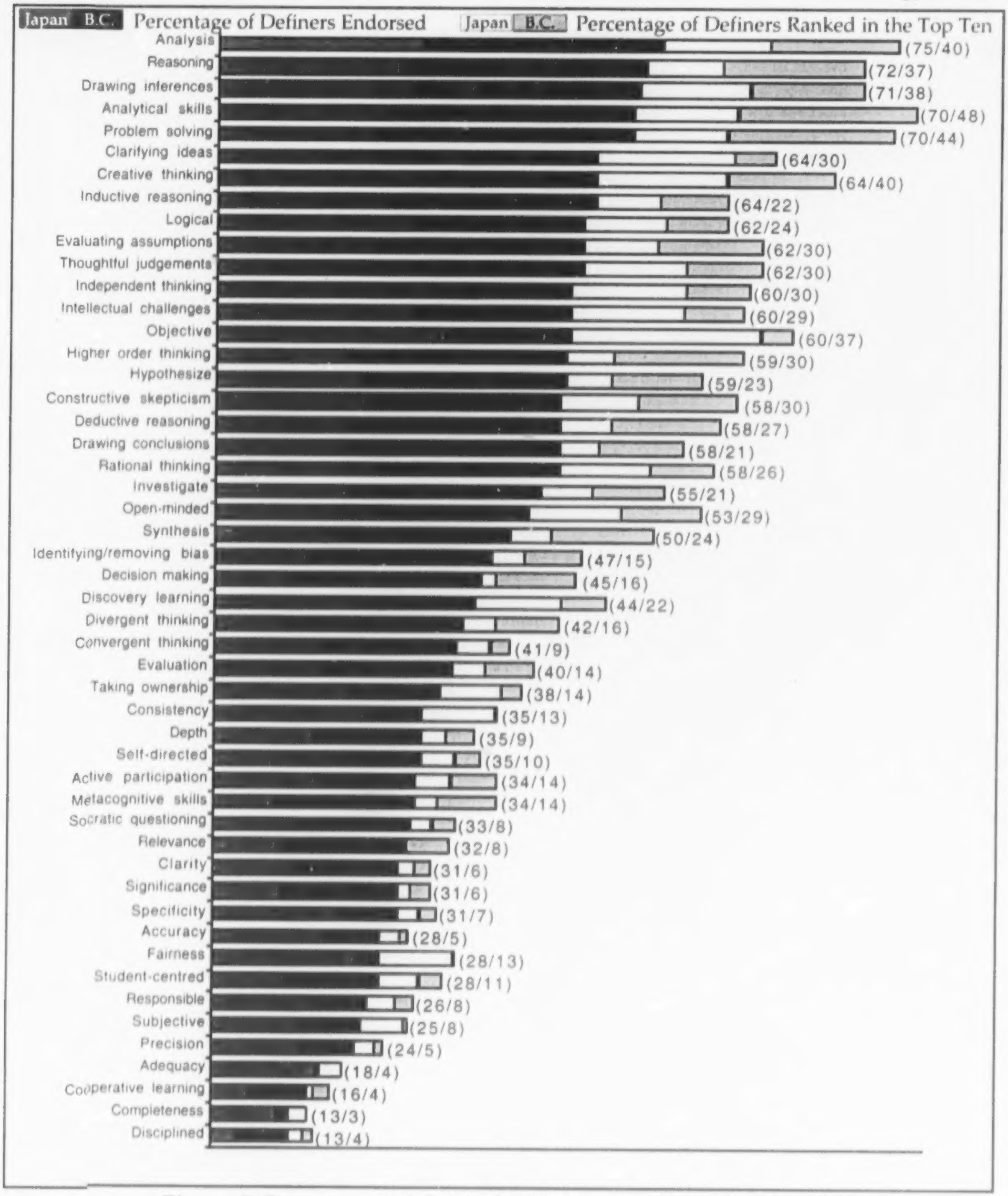

Figure 7. Percentage of Critical Thinking Definers Endorsed, then Subsequently Ranked in the Top Ten

percent ranked it in the top ten. Japanese teachers (36 percent) placed more importance on "Independent thinking" than did B.C. teachers (21 percent). Moreover, 11 percent of the Japanese teachers ranked it as their number one selection, in contrast to the B.C. teachers where only three percent gave it the top rank. This is counter to the stereotypical` notions of Japanese valuing the group over the individual and Western views of creating independence at the expense of all else.

Other interesting comparisons can be found with "Creative thinking," "Problem solving," "Reasoning," and "Thoughtful judgements." While nearly the same percentage of teachers from B.C. and Japan chose "Thoughtful judgements," 30 of the 88 Japanese teachers (34 percent) ranked it and 4 chose it as the number one most significant definer. In contrast, only 18 of the 71 B.C. teachers (25 percent) ranked it and it was not chosen as number one. This serves to illustrate an important characteristic of the data—Japan's teachers were more selective in their choices. B.C.'s teachers tended to chose more definers (see Table 4, 'Total Words Endorsed'). Thus, the ranking is helpful in determining which definers are most significant to teachers' conceptions of critical thinking.

The Structure of Critical Thinking

While performing the analysis, there appeared to be considerable overlap in responses as evidenced by the large number of definers chosen by many teachers (see Table 4). Hence, a teacher claiming that "Analysis" is part of critical thinking was also likely to endorse "Analytical skills" and twenty or more other definers on average. Therefore, it was decided to reduce the data into more manageable, and possibly more meaningful categories. Factor analysis, using SPSS was determined to be the most efficient means to achieve this.

Elements of Critical Thinking and the Factoring Procedure

The correlation matrix of 50 critical thinking definers for the 158 respondents for whom data was available, yielded 15 factors with eigenvalues greater than one, accounting for 65.6 percent of the common factor variance (see Appendix D). This matrix was subjected to a principal component analysis with equamax and varimax rotations with four, five and six of the largest factors. A five factor solution with equamax rotation yielded the most interpretable factor structure and accounted for 40.9 percent of the common factor variance (see Table 8).

Factors of Critical Thinking

The five factors were labeled: (1) *Scientific Reasoning*, (2) *Cognitive Strategizing*, (3) *Conscientious Judgements*, (4) *Relevance* and (5) *Intellectual Engagement*. For clarity, Table 8 shows only loadings .40 and greater.

Factor 1: Scientific Reasoning

Factor 1, *Scientific Reasoning*, accounted for 10.2 percent of the common factor variance. It consisted of the following eight definers of critical thinking: Drawing inferences (.68), Hypothesize (.65), Convergent thinking (.59), Inductive reasoning (.59), Creative thinking (.50), Problem solving (.46), Drawing conclusions (.46) and Deductive reasoning (.41). These definers incorporate a scientific quality exemplifying a 'sleuth-like' search for deeper understanding.

Table 8
Critical Thinking Factor Loadings

Critical Thinking Definers	Factor 1 Scientific Reasoning	Factor 2 Cognitive Strategizing	Factor 3 Conscientious Judgements	Factor 4 Relevance	Factor 5 Intellectual Engagement
Drawing inferences	.68				
Hypothesize	.65				
Convergent thinking	.59				
Inductive reasoning	.59				
Creative thinking	.50				.47
Problem solving	.46				
Drawing conclusions	.46			.44	
Metacognitive skills		.70			
Constructive skepticism		.64			
Socratic questioning		.61			
Identifying/removing bias		.59			
Rational thinking		.55			
Higher order thinking		.54			
Evaluating assumptions		.46			
Open-minded		.40			
Deductive reasoning	.41	.44			
Accuracy			.68		
Consistency			.61		
Objective			.60		
Adequacy			.58		
Specificity			.54		
Precision			.54		
Fairness			.51		
Logical			.49		
Responsible			.45		
Clarity				.61	
Relevance				.53	
Decision making				.52	
Significance				.51	
Completeness				.50	
Synthesis				.41	
Active participation					.62
Taking ownership					.56
Discovery learning					.56
Student-centred					.54
Intellectual challenges					.54
Self-directed					.45
Subjective					.44
Independent thinking					.43
Cooperative learning				.42	.43
percent of variance explained:	10.2 %	8.6 %	8.3 %	7.4 %	6.5 %
percent cumulative variance:	10.2 %	18.8 %	27.1 %	34.5 %	41.0 %

all percents after rotation

Factor 2: Cognitive Strategizing,

Factor 2, *Cognitive Strategizing,* accounted for 8.6 percent of the common factor variance. It consisted of the following nine definers of critical thinking: Metacognitive skills (.70), Constructive skepticism (.64), Socratic questioning (.61), Identifying/removing bias (.59), Rational thinking (.55), Higher order thinking (.54), Evaluating assumptions (.46), Deductive reasoning (.44) and Open-minded (.40). These definers represent higher order cognitive strategies that encourage probing questions and critical responses.

Factor 3: Conscientious Judgements

Factor 3, *Conscientious Judgements,* accounted for 8.3 percent of the common factor variance. It consisted of the following nine definers of critical thinking: Accuracy (.68), Consistency (.61), Objective (.60), Adequacy (.58), Specificity (.54), Precision (.54), Fairness (.51), Logical (.49) and Responsible (.45). These definers embody ethical, moral and conscientious judgements made in a disciplined and systematic manner.

Factor 4: Relevance

Factor 4, *Relevance,* accounted for 7.4 percent of the common factor variance. It consisted of the following eight definers of critical thinking: Clarity (.61), Relevance (.53), Decision making (.52), Significance (.51), Completeness (.51), Drawing conclusions (.44), Cooperative learning (.42) and Synthesis (.41). These definers reflect the clear, concise and unambiguous nature of critical thinking. Also, there is a link between the cognitive and affective domains in the definers of Factor 4. For example, Drawing conclusions and Synthesis may have concrete learning outcomes manifested in Completeness and Clarity.

Factor 5: Intellectual Engagement

Factor 5, *Intellectual Engagement,* accounted for 6.5 percent of the common factor variance. It consisted of the following ten definers of critical thinking: Active participation (.62), Discovery learning (.56), Student-centred (.54), Intellectual challenges (.54), Creative thinking (.48), Self-directed (.45), Subjective(.44), Independent thinking (.43), Taking ownership (.56) and Cooperative learning (.43). These definers share a constructivist approach to critical thinking—intellectual engagement occurs when an individual is actively involved in the learning process and intrinsically motivated.

Scale Scoring

Recall that respondents were asked to either endorse or reject cards purporting to describe attributes of critical thinking. Thus, if a definer was chosen it was coded "1"; a rejected definer was coded "0". Initially, mean scale scores were derived by summing over responses to the definers comprising each factor and dividing by the number of definers within each equamax factor. However, the results also showed that the total number of critical thinking definers chosen by each teacher was significant (p<.001) across all five factors. In order to correct for this artifact, normalized scale scores were derived by taking the scale scores divided by the total number of definers chosen. Thus, normalized scale scores ranged from zero to one. Larger scores indicated a greater correlation to critical thinking. While means and standard deviations were readily available for all the data, a correlation matrix provided the most concise way to summarize the results. Table 9 shows the relationships between normalized scale scores associated with the five critical thinking factors and selected socio-demographic characteristics of B.C. and Japanese teachers.

Table 9
Relationships Between Critical Thinking Scale Scores and Socio-demographic Characteristics of B.C. and Japanese Teachers

Correlation (r=Pearson)	Scientific Reasoning	Cognitive Strategizing	Conscientious Judgements	Relevance	Intellectual Engagement
Culture (Japan=0, B.C.=1)	.15	.28**	-.51**	.37**	-.26*
Gender (Woman=0, Man=1)	-.03	-.12	.18	-.05	.05
Age	.12	-.19	.15	-.03	-.03
Teaching experience	.13	-.21*	.18	-.10	.01
Critical Thinking in curriculum	.04	-.05	-.08	-.02	.05
Critical Thinking in classroom	-.05	.02	-.14	-.07	.14
Number of Critical Thinking definers chosen	-.01	.02	-.06	.28**	-.02
Subject Area (r=Eta)	.26	.34*	.18	.20	.19
		Mean SD			
Language Arts	--	.25 .10	--	--	--
Math	--	.18 .07	--	--	--
Science	--	.21 .08	--	--	--
Social Studies	--	.24 .11	--	--	--
Fine Art	--	.21 .15	--	--	--
Foreign Languages	--	.20 .11	--	--	--
Other	--	.16 .09	--	--	--

Note: Minimum pairwise N of cases = 158 2-tailed significance: * p< .01 ** p< .001
Normalized Scale Scores used for all five factors.

Relationships Between Critical Thinking Scale Scores and Socio-demographic Characteristics of B.C. and Japanese Teachers

Of the 159 teachers surveyed, 158 provided data for the factor analysis and the normalized scale scores reported in Table 9. One Japanese teacher refused to complete the card sort procedure as he felt it was ambiguous, yet his comments and questionnaire provided valuable qualitative insights so he was included in the rest of the analysis. Pearson coefficients were used to show correlations between Culture, Gender, Age, Teaching experience, Critical Thinking in the curriculum, Critical Thinking taught in the classroom, Number of Critical Thinking definers chosen and the normalized scale scores from the five factors. Larger absolute values in Table 9 indicate stronger correlations. Since teachers from Japan and B.C. were coded with "0" and "1" respectively, positive coefficients in the first row of Table 9 reflect factors that were endorsed more by B.C. teachers while negative coefficients reflect factors that were endorsed more by Japanese teachers. Likewise, since women and men were coded with "0" and "1" respectively, positive coefficients in the second row of Table 9 reflect factors endorsed more by men while negative coefficients reflect factors endorsed more by women. The characteristics of Teaching experience and Age were entered directly into SPSS as whole number integers, therefore negative coefficients in the Teaching experience and Age rows of Table 9 indicate negative correlations (less experience or younger). The questions "Is Critical Thinking part of the curriculum in your subject area?" and "Do you teach Critical Thinking in your classroom?" were coded "0," "1," and "2" for the responses "No," "Maybe," and "Yes," respectively. Finally, since the characteristic of Subject area does not enable a Pearson correlation, an Eta coefficient was used instead. As correlations were most succinct in reporting the results, means and standard deviations were only included in the one case showing a significant difference between subject areas.

Culture

There was a clear distinction and significant difference between B.C. and Japanese teachers on four factors. While *Cognitive Strategizing* (r = .28, p<.001) and *Relevance* (r = .37, p<.001) were of greater significance to the B.C. teachers, *Conscientious Judgements* (r = -.51, p<.001) was far more so for the Japanese teachers. In addition, but to a lesser extent *Intellectual Engagement* (r = -.26, p<.01) was also found to be more significant to the Japanese teachers.

Gender/Age/Teaching Experience

There were no significant differences in the teachers' conceptions of critical thinking based on their gender or age (see Table 9). However, teachers with less experience supported *Cognitive Strategizing* (r = -.21, p<.01) significantly more than experienced teachers. Older more experienced teachers may have different views than their younger colleagues, reflecting significant changes in teacher education over the past three decades. "Critical thinking" is a relatively new concept, however the underlying ideas of critical thinking are not. Thus, while less experienced teachers were more likely to endorse *Cognitive Strategizing* and were more familiar with the newer terminology (for example: Metacognitive skills), taking all five factors into account there appears to be more solidarity among teachers as a collective group than age or experience can dictate.

Critical Thinking in the Curriculum and the Teaching of Critical Thinking

The response to questions "Is critical thinking part of the curriculum in your subject area?" and "Is critical thinking taught in your classroom?" provide data to determine whether critical thinking is a significant part of B.C. and Japanese teaching and the curriculum at the secondary level (see Tables 10–11). While 62 percent of the B.C. teachers indicated critical thinking was part of the curriculum and over 70 percent claimed to teach it in their classroom, 24 percent of the respondents were unsure. There was even more indecision on the part of Japan's teachers. While 41 percent of the Japanese teachers indicated that critical thinking was part of the curriculum only 34 percent claimed to teach it and 38 percent were unsure. There was no strong correlation between teachers who indicated that critical thinking was a part of the curriculum for their subject area and any of the normalized scale scores for the five factors (see Table 9). Moreover, there was no strong correlation between teaching critical thinking in the classroom and any of the normalized scale scores for the five factors.

Table 10
Critical Thinking as Part of the Prescribed Curriculum

			B.C.	Japan	Total
Critical Thinking part of the curriculum	no	Count	10.0	25.0	35.0
		% of Teachers from:	28.4	14.1	22.0
	unsure	Count	17.0	27.0	44.0
		% of Teachers from:	23.9	30.7	27.7
	yes	Count	44.0	36.0	80.0
		% of Teachers from:	62.0	40.9	50.3
Total		Count	71.0	88.0	159.0
		% of Teachers from:	100.0	100.0	100.0

Table 11
Critical Thinking Taught in the Classroom

			B.C.	Japan	Total
Critical Thinking taught in the classroom	no	Count	4.0	25.0	29.0
		% of Teachers from:	5.7	28.5	18.3
	unsure	Count	17.0	33.0	50.0
		% of Teachers from:	24.0	37.6	31.5
	yes	Count	50.0	30.0	80.0
		% of Teachers from:	70.5	34.2	50.4
Total		Count	71.0	88.0	159.0
		% of Teachers from:	100.0	100.0	100.0

Total Number of Critical Thinking Definers Chosen

Even after taking into account the total number of definers selected by each teacher using the normalized scale scores, there still remained one factor that correlated significantly with the number of definers chosen. Teachers who chose a greater number of definers tended to score higher on *Relevance* (r = .28, p<0.001). One possibility is that this is merely an anomaly. Another possible explanation is those teachers that valued *Relevance* happened to spend more time on the card sort procedure and thus were more likely to chose a greater number of definers.

Subject Areas

In comparing the data across subject areas taught, interesting similarities and contrasts were found (see Table 9). *Cognitive Strategizing* was the only scale score to show any significant differences (r = .34, p<.01) between teachers of various subjects. Language Arts teachers scored highest, followed closely by Social Studies teachers while Other teachers scored lowest. Perhaps this is due to the diverse nature of the Other group and their predominantly vocational nature. Moreover, terms such as Socratic questioning while common to humanities teachers were likely unfamiliar to many of the Other teachers.

Summary

B.C. and Japanese secondary teachers' conceptions of critical thinking were compared and contrasted. There were significant differences between B.C. and Japanese teachers for 27 of the 50 critical thinking definers. The discriminant analysis successfully classified 96.9 percent of teachers as either B.C. or Japanese. B.C. teachers tended to view critical thinking through definers such as "Decision making," "Problem solving," "Divergent thinking," "Metacognitive skills," "Higher order thinking," "Deductive reasoning," and "Identifying/removing bias" while they favoured the factors of *Cognitive Strategizing* and *Relevance.* On the other hand, Japanese teachers characterized critical thinking through definers such as "Fairness," "Adequacy," "Objective," "Consistency," "Completeness," "Precision," and "Specificity" while they favoured *Conscientious Judgements* and *Intellectual Engagement.* There were no significant differences in the teachers' conceptions of critical thinking based on their gender or age. Yet, language arts teachers, social studies teachers, and teachers with less experience, tended to support *Cognitive Strategizing* more than their other colleagues. Critical thinking would appear to be a significant part of B.C. and Japanese teaching and the curriculum at the secondary level. However, critical thinking in its present context is much more pervasive in the classrooms of the B.C. teachers studied... or perhaps it is just better understood.

While the results of the data analysis have answered the original purposes of the study, some questions remain.What are teachers' conceptions of critical thinking in their own words? How can critical thinking best be taught? Are there further qualitative differences between B.C. and Japan that need to be investigated? What are the implications of this study?

CHAPTER 7

DISCUSSION

The results of this study are relevant to B.C. and Japan since both education systems were undergoing significant reforms to teacher education with a focus on critical thinking. While over half the teachers surveyed indicated that they taught critical thinking, many had difficulty expressing exactly how to teach it effectively. Teachers admitted that they had to think critically just to complete the survey! The most difficult part of the card sort procedure was ranking the top 10 words. This task required teachers to reflect on the meaning of critical thinking, teaching philosophy and practice. In addition, open-ended questions "What is critical thinking?" and "How is critical thinking taught?" posed a real challenge, because although teachers value critical thinking, they have not had to think about it nor have they discussed it with their colleagues. Instead, critical thinking is a tacit concept and an implicit part of their teaching philosophy rarely articulated. As a result, some teachers were unable to complete all the questions or gave up because it required too much time and thought. However, several teachers said they benefited from taking part in the survey since it required them to think critically and to reflect on their teaching practice.

Teachers' Conceptions of Critical Thinking

Whereas the preceding chapter focused on quantitative data analysis, the qualitative aspects were merely woven into the analysis. Here more attention is given to teachers responses to the open-ended questions. Thus, what follows are salient examples of teacher's definitions of critical thinking:

> Critical thinking is the ability to deductively reason, break down a problem into workable components and formulate an answer. (B.C., Queen Elizabeth, science teacher)
>
> Critical thinking is problem solving; an in depth thinking that goes beyond a face value response; investigating for specifics to support one's thoughts and opinions/judgements. (B.C., North Surrey, language arts teacher)
>
> Critical thinking is making links to "what you know already" to "new ideas" presented. (B.C., Elgin Park, science teacher)
>
> Critical thinking is to get students to consider things from various angles and to let them go through their own thinking process. (Japan, Komaba, social studies teacher)
>
> Critical thinking is to think deeply about something, then to analyze it and finally to make judgements or come to a conclusion. (Japan, Tsukuba, English teacher)

While these teachers were able to adequately describe what their conception of critical thinking was, others were unsure of the meaning. Some Japanese teachers confused *"hihanteki shikou* (critical thinking)" with *"dokuritsushita shikousei* (independent thinking)" or *"ikiru chikara* (life-long learning)." More than a few individuals simply wrote "I don't know" in response to the question, "What is critical thinking?" while some took it too literally. In Japan, the word "critical" has a negative connotation and in the translation can be misconceived such that the meaning is quite literally "to question authority" or "to not accept things as they appear" as in someone who is critical of the government. One English teacher from Komaba suggested that "critical thinking" is a problematic word and therefore a new Japanese term is needed to describe the concept.

How Critical Thinking is Taught

Critical thinking is valued by B.C. and Japan's secondary teachers, however it has various meanings and how it is to be taught is not well understood. Can critical thinking be taught? Some teachers felt critical thinking can best be fostered outside the secondary school classroom. According to one teacher from B.C., "critical thinking can't be taught... it can (however) be demonstrated and developed all through life, with early lessons (home, elementary school) being most important." Others felt critical thinking was of primary importance to schooling and must be taught. In the words of one Japanese teacher, "it is the basic foundation for high school education." Assuming then, that critical thinking (at least as these teachers perceive it) is taking place in secondary school classrooms—how is it being incorporated into the B.C. and Japanese course curricula? What follows are responses to the question, "How do you teach critical thinking?":

> Students need to understand what critical thinking is before they can engage in the process. (B.C., Enver Creek, social studies teacher)
>
> Pursue the "why" behind the 'rote' answers. (B.C., Fleetwood Park, business education teacher)
>
> Students make up their own labs... (B.C., North Surrey, science teacher)
>
> Assigning open-ended case studies/problems/issues for students to discuss, debate, and evaluate. (B.C., Princess Margaret, science teacher)
>
> Have students write down their own ideas and then present them to the class. Express an opinion about the others' ideas, discuss them together and then write a summary. (Japan, Otsuka, math teacher)

> I let the students discover problems, let them think about how to solve the problems and then let them go about doing it on their own. (Japan, Sakado, home economics teacher)
>
> After I help them to understand the content of the text, I let them state their own opinion. (Japan, Otsuka, English teacher)
>
> From historical references, find various aspects to compare and evaluate with existing theories and daily/modern phenomena. (Japan, Otsuka, social studies teacher)

Just as there are many different teaching styles there are many different contexts in which critical thinking may take place. Numerous books available with titles such as "Teaching Critical Thinking," "Teaching Students to Think Critically," and "Critical Thinking Across the Curriculum" purport to guide the way for novice teachers. However, these materials remain in the domain of mostly the academics who publish and read English-speaking journals found in university library collections. While, many teachers do not use words such as "Metacognitive skills" or "Socratic questioning" to describe critical thinking, they implicitly use these techniques in their classroom teaching as evidenced by their responses to the open-ended questions.

Comparative Perspective

Are there significant differences between B.C. and Japanese secondary teachers' conceptions of critical thinking? The simple answer to this question is "yes" but to leave it unexplored would be to miss important findings. As teachers understand critical thinking within their own conceptual frameworks and cultural contexts, there are bound to be differences between B.C. and Japanese teachers. However, there are far too many similarities to be ignored. While factor analysis is a powerful tool in data reduction, it relies on differences but not between cultures. Critical thinking definers that were chosen by nearly all teachers would likely not be loaded into any one factor. Of the fifty definers, five were double loaded and ten loaded below .40 and thus were not included in the scale scoring (see Appendix D). Recall that 75 percent of the teachers chose "Analysis" and 72 percent chose "Reasoning," yet these definers of critical thinking were not included in any of the five factor solutions as they did not load above .40 in any one factor. Moreover, some of the differences between B.C. and Japanese teachers can be attributed to problems inherent in the translation of the word "critical thinking" in addition to cultural considerations. Once these are taken into account however, the results can be better understood.

While B.C. teachers tended to relate critical thinking to the cognitive domain, Japanese teachers tended to favour the affective domain. This contrast between Eastern and Western thinking is well documented (Cummings & Altbach, 1997; Lewis, 1995; Gardner, 1989; Nakane, 1970; Reid, 1999; Rohlen & LeTendre, 1996; Shields, 1993; Shimahara & Sakai, 1995; Stern, 1995; Stevenson & Lee, 1995; Stevenson & Stigler, 1992). Gardner (1989) describes a "key in the lock" story that further illustrates contrasts in Eastern and Western ways. When traveling in South East Asia, Gardner and his wife were about to enter their hotel room when their two year old son insisted on taking the key to open the lock. Rather than guide the child's hand, showing him how to open the door, they let the child discover for himself through the process of trial and error how it is done. A Chinese observer questioned why they don't simply show the child how to open the door by guiding his hand and thus avoiding any "mistakes."

As there is only one "right" way of doing things, the Eastern philosophy is to have an expert teach the "right" way and thus avoid the common mistakes made by a neophyte. Once this is demonstrated it must be practiced over and over many times until it is learned. Traditionally, "mistakes" were not encouraged in Japanese classrooms. Students didn't question their teachers. There was knowledge to be transmitted from teacher to student with little room for debate. Perhaps these stereotypes are being challenged as Japan begins to embrace a critical thinking approach to learning.

While Japanese may be characterized as group oriented, British Columbians are more independent. Japanese individuals do what is best for the group in order to keep harmony with others while maintaining a sense of honour and morality. Equality, patience, persistence, pride, humility, unity, and community spirit may best describe Japan's teachers. The Japanese school curriculum emphasizes in addition to course content, socialization, morality and behaviour, rather than cognitive abilities. On the other hand, B.C. teachers could best be described as diverse, self-reliant, individualistic, original and opinionated. The B.C. school curriculum emphasizes creativity, independent thinking and cognitive processes. Japanese students are taught lessons such as "do not say things to upset others," "don't voice your opinion," "the needs of the few do not outweigh the needs of the many," "the nail that sticks out gets hammered down" and "practice, practice, practice... practice makes you master." In contrast, B.C. students are taught to state an opinion, be critical, think for oneself and be oneself. While originality is celebrated and encouraged by B.C.'s teachers, the same can't be said for Japan's teachers. Thus, "critical thinking" will have different connotations within the cultural context of the two regions.

There was less agreement (or perhaps more confusion associated with the term "critical thinking") among Japanese teachers. However, B.C.'s teachers were not all of one mind either. While some may value *Relevance* more than *Cognitive Strategizing* others may feel strongly about some other dimension of critical thinking. Yet, these are not mutually exclusive concepts and the relative proportions of them in anyone's definition are likely to change depending on the context of the learning. Perhaps this can best be illustrated with a metaphor. Each individual's conception of critical thinking may be thought of as a five dimensional critical thinking "amoeba" free to move about within the domain of *Scientific Reasoning, Conscientious Judgements, Cognitive Strategizing, Relevance* and *Intellectual Engagement.*

Although there were significant differences between B.C. and Japan's secondary school teachers' conceptions of critical thinking, the similarities were meaningful. Looking beyond the semantics of the words used to describe critical thinking and researching deeper into the underlying concept, the common aspects have been uncovered.

The results indicate that the general notion of critical thinking is supported by most of the teachers surveyed. This support crossed the boundaries of gender, age, teaching experience, subject area, and most importantly where the teachers were from. While the precise meaning of "critical thinking" is different for each individual, there were common elements to each teacher's conception and how it was supported in their classroom. For many of the teachers surveyed, two or more of the five factors—*Scientific Reasoning, Cognitive Strategizing, Conscientious Judgements, Relevance* and *Intellectual Engagement* were endorsed.

As the thesis progressed, my own conception of critical thinking evolved from a vague notion of higher order thinking such as analysis, synthesis, and evaluation to a complex philosophy of thought. My definition of critical thinking became a fusion of expert opinions from the literature, teacher conceptions from this study and reflections from personal teaching experience. Critical thinking consists of many dimensions as well as strategies to be used depending on the context of the situation. The Foundation for Critical Thinking (2000) web site lists no fewer than 35 affective and cognitive strategies describing the teaching of critical thinking to high school students:

A. Affective Strategies

- S-1 thinking independently
- S-2 developing insight into egocentricity or sociocentricity
- S-3 exercising fairmindedness
- S-4 exploring thoughts underlying feelings and feelings underlying thoughts
- S-5 developing intellectual humility and suspending judgment
- S-6 developing intellectual courage
- S-7 developing intellectual good faith or integrity
- S-8 developing intellectual perseverance
- S-9 developing confidence in reason

B. Cognitive Strategies - Macro-Abilities

- S-10 refining generalizations and avoiding oversimplifications
- S-11 comparing analogous situations: transferring insights to new contexts
- S-12 developing one's perspective: creating or exploring beliefs, arguments, or theories
- S-13 clarifying issues, conclusions, or beliefs
- S-14 clarifying and analyzing the meanings of words or phrases
- S-15 developing one's perspective: creating or exploring beliefs, arguments, or theories
- S-16 evaluating the credibility of sources of information
- S-17 questioning deeply: raising and pursuing root or significant questions
- S-18 analyzing or evaluating arguments, interpretations, beliefs, or theories
- S-19 generating or assessing solutions
- S-20 analyzing or evaluating actions or policies
- S-21 reading critically: clarifying or critiquing texts
- S-22 listening critically: the art of silent dialogue
- S-23 making interdisciplinary connections
- S-24 practicing Socratic discussion: clarifying /questioning beliefs, theories, or perspectives
- S-25 reasoning dialogically: comparing perspectives, interpretations, or theories
- S-26 reasoning dialectically: evaluating perspectives, interpretations, or theories

C. Cognitive Strategies - Micro-Skills

- S-27 comparing and contrasting ideals with actual practice
- S-28 thinking precisely about thinking: using critical vocabulary
- S-29 noting significant similarities and differences
- S-30 examining or evaluating assumptions
- S-31 distinguishing relevant from irrelevant facts
- S-32 making plausible inferences, predictions, or interpretations
- S-33 giving reasons and evaluating evidence and alleged facts
- S-34 recognizing contradictions
- S-35 exploring implications and consequences

The B.C. and Japanese teachers' conceptions of critical thinking reflected many of the experts' suggested strategies. For example, Japanese teachers supported Fairness and Completeness (see Figure 6) roughly corresponding to the affective strategies S-3 exercising fair-mindedness and S-8 developing intellectual perseverance, respectively. On the other hand, B.C. teachers endorsed Decision making and Deductive reasoning (see Figure 6) roughly corresponding to the cognitive strategies S-19 generating or assessing solutions and S-25 reasoning dialogically: comparing perspectives, interpretations, or theories.

My own interpretation of critical thinking is thus a synthesis of research from experts in the field of critical thinking and data from teachers surveyed. I view critical thinking as a process in which an individual is actively engaged in analyzing, reasoning, questioning, and creatively searching for alternatives in an effort to solve a problem or to make a decision or judgement. In summary, critical thinking may best be described as powerful thinking.

Implications of the Study

There is increasing support for developing critical thinking from educators and the public in both B.C. and Japan. The teachers in this study indicated critical thinking is of great importance. Although there were many opinions on how critical thinking can best be taught, most teachers supported the notion critical thinking can be fostered—provided students are given opportunities to ask questions, to analyze problems, to use reasoning and to think creatively in order to make judgements. These are not merely enrichment activities but rather they should be an integral part of all curricula as they are important "life-skills," necessary in the work-place and elsewhere. While a few teachers felt high school students were incapable of critical thinking, most indicated that they expected students to graduate from high school with the ability to think critically.

While this study analyzed teachers' conceptions of critical thinking, more research is necessary to explore some of the implications. If critical thinking is to be implemented across the curriculum in B.C or Japan's high schools, how can it best be integrated into the reforms currently taking place in each education system? Specifically, how can teachers incorporate critical thinking into their lessons? Also, how can critical thinking become better understood—especially by Japan's teachers? Critical thinking is a Western expression, yet the concept is not confined to the West. Thus, it is necessary to find a comparable Japanese phrase to replace *hihanteki shikou* with an expression that will be better understood, with less emphasis on "critical" and more emphasis on "thinking." What would be a more suitable Japanese term for critical thinking? A suggestion which was well received by the Japanese educators in the study, is to adopt a new Japanese phrase for critical thinking, *kangaeru chikara—kangaeru,* the verb "to think" and *chikara* meaning "power or ability." Perhaps *kangaeru chikara* better encompasses the nature of critical thinking as it is conceived by B.C. and Japan's teachers.

CHAPTER 8

SUMMARY AND CONCLUSIONS

British Columbia and Japan have been undergoing significant educational reforms in efforts to improve student learning within the context of the emerging global village. Critical thinking as an integral part of these reforms has received much attention from educators, yet it remains largely undeveloped in traditional teacher-centered classrooms. While "critical thinking" is highly valued by educators in B.C. and Japan, there must be further research into the way it is understood and how it can best be taught within these two education systems.

Critical Analysis of the Methodology

The purposes of this study were (1) to obtain an overall sense of what secondary school teachers believed critical thinking to entail; (2) to compare and contrast B.C. and Japanese secondary teachers' conceptions of critical thinking; (3) to investigate the nature of B.C. and Japanese secondary teachers' conceptions of critical thinking with respect to gender, age, teaching experience and subject taught; and (4) to determine whether critical thinking is a significant part of B.C. and Japanese teaching and the curriculum at the secondary level. In order to achieve these objectives, 159 teachers from ten high schools were selected from a variety of subject backgrounds, ages and experience to complete a critical thinking card sort and questionnaire. Relationships between the characteristics of gender, age, teaching experience, subject area, and the teachers' conceptions of critical thinking were investigated and analyzed across the two cultures.

Methodological problems included (1) the layout of the questionnaire; (2) the selection of critical thinking definers; (3) the assumption that 50 definers could adequately describe an individual's concept of critical thinking; and (4) the selection of participants and schools. In order to critically analyze the methodology of this study, each of these potential liabilities must be carefully examined and suggestions made for improvements.

A limitation and potential shortcoming of the instruments used includes the layout of the questionnaire (see Appendix A, and note that the instructions 1–3 for sorting and ranking were originally on page one of a legal-sized paper). Possibly, some respondents didn't read the instructions carefully, skipped the sorting and chose only ten definers which they ranked on the first page of the questionnaire. Future studies employing a sorting of cards and questionnaire should clearly differentiate between the tasks of sorting and ranking. One suggestion is to place the instructions for the sorting on the first page and the ranking on the following page (as shown in Appendix A). Thus, respondents would be more inclined to do the sorting before turning the page to begin the ranking procedure.

Another consideration relating to improvements in instrument design is the selection of the definers to be written on the index cards. Most of the definers came from Western literature on critical thinking. This bias could affect the results. In the future, literature from both cultures should be consulted and carefully examined before a pilot study is done. In order to avoid cultural bias, some definers should be carefully scrutinized for potential misunderstandings and removed or replaced if necessary. A case in point, upon completion of the factor analysis, the five factors had to be named. To reduce the 50 definers to only five succinct and meaningful factors was a difficult task. The choice of words was at times a compromise. When the five factors were double translated for accuracy, Factor 4, *Relevance* was not well understood by the Japanese graduate student asked to assist in this matter (a different individual than the graduate student used in the original translation of the 50 definers). He indicated that this factor needed a different name in Japanese. He preferred to use "Clarity" which was another definer that characterized Factor 4. Finally, if there were translation inaccuracies or ambivalent translations this could have affected the data to some extent. While care was taken to have the critical thinking definers double-translated by fluently bilingual educators, further procedures must to put into practice in order to ensure validity and cultural suitability. Perhaps consulting more than two individuals from each region would help solve this problem.

Related to this language issue is a criticism heard at a presentation given at the Comparative and International Education Society Conference held in San Antonio, Texas in March 2000. A Japanese colleague commented that individuals would have different conceptions of each of the 50 definers as well as "critical thinking," irrespective of their culture. But if this perspective is taken too literally, how are comparative educators to continue international cross-cultural research? Naturally, language and culture are embedded in any international comparative study. How else can a concept be investigated and compared across two or more cultures?

Finally, an additional criticism is that external validity could have been compromised in the selection of schools. Schools were selected with the help of personal connections. Each of the B.C. schools were in the school district of the researcher. All the schools selected in Japan had ties to a researcher at Tsukuba University.

Critical Analysis of the Results

There were significant differences between B.C. and Japanese teachers for 27 of the 50 critical thinking definers. The discriminant analysis successfully classified 96.9 percent of teachers as either B.C. or Japanese. The results of scale scoring the factor analysis showed that B.C. teachers viewed critical thinking more as *Cognitive Strategizing* and *Relevance* while Japanese teachers favoured *Conscientious Judgements* and *Intellectual Engagement*.

There were no significant differences in the teachers' conceptions of critical thinking based on their gender or age. Yet, language arts teachers, social studies teachers and teachers with less experience tended to support *Cognitive Strategizing* more than their other colleagues. Critical thinking would appear to be a significant part of B.C. and Japanese teaching and the curriculum at the secondary level. However, critical thinking in its present context seems more pervasive in B.C.'s classrooms. "Critical thinking" is more popular in B.C. but is misunderstood by teachers on both sides of the Pacific. Is "critical thinking" a skill or is it an abstract concept?

According to the teachers surveyed, critical thinking is a process in which an individual is actively engaged in analyzing, reasoning, questioning, and creatively searching for alternatives in an effort to solve a problem or to make a decision or judgement. Critical thinking can't be learned in isolation. It can't be taught explicitly but rather must be integrated in all subject areas and related to the ideas students already have.

Levels of Critical Thinking

Critical thinking is an abstract concept used in at least three major contexts or levels of discourse: (1) the media and general public, (2) teacher pedagogy, and

(3) academic discourse. It is essential that critical thinking be better understood by individuals within all three levels, for "critical thinking" is on the verge of becoming diluted in meaning much like "internationalization" or "globalization." "Critical thinking" is not well understood. It may have become merely another "buzzword" in education and may have been used without much thought to its true meaning by many educators, politicians and the general public. Developing "critical thinking skills" is seen by some as a panacea to the ills of our education system. While some teachers were able to adequately describe their conception of critical thinking, others were unsure of the meaning. Finally, the word "critical" has a negative connotation and in the translation can be misconceived and therefore the new Japanese term *kangaeru chikara* should be used to describe the concept of critical thinking.

Comparative Education Perspective

During the pre-conference seminar of The Second Asia-Pacific International Symposium of Teacher Education held at Waseda University, Tokyo in March 2000, a debate ensued over "critical" comparative education. It was suggested that "critical" comparative education methodologies are necessary in order to apply the wealth of knowledge available through international comparative research. It was posited that "critical" comparative education had two dimensions: scientific and value-based judgements. Yet, to compare without judgements or without drawing any conclusions is not "critical" comparative education. Another individual characterized comparative education as necessarily prescriptive as well as descriptive. "Critical pedagogy" was used to describe the nature of "critical" comparative education. Phrases such as "logical-abstract thinking," "child-centred learning through problem solving," "learning by doing," "the ability to identify problems and to learn for oneself" were used to describe "critical thinking." The Japanese educational tradition of *Hansei* or the critical reflection on moral issues was cited as a noteworthy example. The ideal teacher was characterized as someone who fostered critical thinking in students. Also, it was suggested critical thinking would have the effect of making students more humanistic. The meaning of the word "critical" was something that occupied over 20 minutes of discussion from some of the world's leading researchers in comparative education and yet no consensus on the meaning of "critical" was reached.

Many phenomena can't be described by language alone. Languages have evolved differently in various cultures. European languages always have the individual centred in the dialogue while Japanese language is based on space rather than form. For example, the sentence, "I am cold." is just *samui* (adjective, meaning "cold"). "I" is rarely articulated in Japanese as it is understood within the context of the situation. In any literal translation there are subtle nuances that are often not conveyed or the meaning can be altered. An important concept that was often confused with critical thinking, *Ikiru chikara* or "life-long learning" is central to B.C. and Japan's educational reforms as *kangaeru chikara* or critical thinking is essential to solving the problems facing our world. To embrace these new paradigms in learning significant reforms must take place in the form and function of schools as well as the nature of the curriculum. School must be a place where students can explore options and make choices. The teacher must act as a facilitator rather than a disseminator of factual knowledge.

Recommendations and Implications for Future Studies

Both B.C. and Japanese education systems should foster critical thinking while supporting mentorship, collaboration and peer consultation among teachers. Specifically, what B.C. needs is a proposal that will improve student learning as well as the pre-service and in-service training of teachers. Part of the solution lies in Japan's apprenticeship model of teacher education and the professional development school (PDS) as proposed by the Holmes Group of research universities in the U.S., dedicated to the reform of teaching and teacher education. The PDS embodies much of the spirit of collaboration and mentorship of the Japanese model while providing a link between the research of universities and the practice of teaching in schools. The potential of the PDS has recently emerged as one of the most exciting possibilities for systematic educational reform (Petrie, 1995; Levine, 1992). The goals of the PDS school could be realized, with the following changes made to B.C.'s present school system:

1) Redefine the role of the teacher as facilitator and co-learner.
2) Change the structure of the timetable to incorporate time for reflection, sharing and continued professional development.
3) Adopt 6/8 blocks as F.T.E. for Secondary and 4/5 days for Elementary.
4) Hire more "new" teachers (student teachers) at 0.50 F.T.E. (3 or 4 blocks) as learning practitioners for 1 year terms.
5) Pay student teachers at 50 percent of Category 5 (Professional Certificate, 0 years experience).
6) Offer a one year sabbatical for teachers every 5 years for professional development.
7) Support education decision-making by a professional association or college of teachers.

The money saved from hiring beginning teachers as apprentices would more than compensate for the reduced assignments and subsequent salary shortfalls of experienced teachers. Also, more time would be available for reflection and collaboration much like Japanese schools.

In contrast, Japan's education system could be reformed in the following ways:

1) Redefine the role of the teacher as facilitator and co-learner.
2) Decrease class sizes (see #4 below).
3) Implement a more comprehensive extended teaching practicum.
4) Hire more "new" teachers to reduce the increasing stress of teachers.
5) Continue increasing the electives offered in high school.
6) Change the examination system to reduce the stress on students.
7) Offer a sabbatical for teachers every 5 years for professional development.
8) Support education decision-making by a professional association or college of teachers.

In order to facilitate these recommendations for changes to B.C and Japanese education systems, resources may need to be redirected to enhance teacher training, professional development and teaching conditions.

Teachers are in the business of educating students but there is a role for everyone to play. Teachers, administrators, parents, business people, governments and universities must work together, comprehensively in order to evoke educational change. First and foremost, teachers must learn how to think critically for themselves. This is a necessary foundation for critical thinking educational reform. Administrators can ensure that there is long-term inservice for teachers in learning and teaching critical thinking. Parents can provide a home environment in which the intellectual discipline of their children is fostered—where decisions are questioned and problems are reflected on together. Business people can help by pushing governments for educational reform. Since critical thinking is essential to effective group problem solving, progressive business people should network with educators and civic leaders in order to create a public awareness of the importance of critical thinking. The Ministry of Education or Monbusho should fund further research into how to foster critical thinking especially in high school students, universities and teachers in training. Professors should emphasize critical thinking in their classes by routinely fostering reasoning and ensuring that their students regularly assess their own work using intellectual standards.

Critical thinking is not likely to become valued in education unless it is valued by society at large. There is much apathy to overcome. Moreover, some societies may not value critical thinking due to cultural considerations. Japan has just begun to embrace critical thinking yet other nations may not yet be ready. For teachers to foster critical thinking they must first become committed to thinking critically and reflectively about their own lives and the lives of those around them. Teachers must regularly model for students what it is to reflectively examine, critically assess, and effectively improve life.

> Thinking is pre-eminently an art; knowledge and propositions which are the products of thinking, are works of art, as much so as statuary and symphonies. Every successive stage of thinking is a conclusion in which the meaning of what has produced it is condensed; and it is no sooner stated than it is a light radiating to other things- unless it be a fog which obscures them (Dewey, 1929/1958, p. 378).

While over half the teachers surveyed indicated they taught critical thinking, many had some difficulty expressing exactly how to teach it effectively. In order to foster critical thinking by students, teachers must first critique present educational practices and the beliefs underlying them. To understand the nature of critical thinking, educators must be asked fundamental questions about the nature of knowledge, learning and the process of thinking. Through further international comparative studies, education systems can be improved. Teachers must be given opportunities to learn from one another and to benefit from the accumulated wisdom of generations of skilled practitioners. In addition, teachers must be given adequate time for collaboration, planning and reflection. The reforms of education in both British Columbia and Japan require a rethinking of the profession of teaching, for any effort to reform the structure or organization of education ultimately depends on the effectiveness of the teacher.

While this study analyzed teachers' conceptions of critical thinking, some questions remain to be answered. If critical thinking is to be implemented across the curriculum in B.C and Japan's high schools, how can it best be integrated into the reforms currently taking place in each education system? Specifically, how can teachers incorporate critical thinking into their lessons? Also, how can critical thinking become better understood—especially by Japan's teachers? Critical thinking is a fundamental concept in education that requires more study. Further comparative education research is necessary on methodologies, teaching strategies, critical thinking and the role of the teacher. This will help to improve student learning and will provide a cross-cultural and international understanding and appreciation of learning necessary for "life-skills" in the 21st century much like literacy and numeracy for the 20th century.

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APPENDIX A

B.C. & JAPAN SECONDARY SCHOOL TEACHER SURVEY

SECONDARY SCHOOL TEACHERS' CONCEPTIONS OF CRITICAL THINKING IN BRITISH COLUMBIA AND JAPAN - A COMPARATIVE STUDY[1]

Edward Howe; Graduate student at UBC
Roger Boshier; Supervisor - 822-5822

The concept of critical thinking has received much attention among educators internationally, yet critical thinking is an important skill that remains largely undeveloped in traditional teacher–centered secondary school classrooms. Presently, there is much research in progress on the meaning of critical thinking, on the transferability of critical thinking skills to a wide range of subject areas, and on methods of teaching critical thinking. However, there is still some debate exactly what is meant by the term "critical thinking". Previous attempts to define critical thinking have encompassed both its form and function, including the skills and strategies as well as the levels of complexity involved. Often critical thinking has been linked to creative thinking, and problem solving as well as inductive and deductive reasoning. While "critical thinking" is highly espoused by educators and employers both in B.C. and Japan, there has been little examination of the way critical thinking is actually understood within these two education systems. Until now, there has been no comparison of different conceptions of critical thinking held by teachers in B.C. and Japan. In order to foster critical thinking by students, teachers must first critique present educational practices and the beliefs underlying them. To understand the nature of critical thinking, educators must be asked fundamental questions about the nature of knowledge, learning and the process of thinking. Therefore, having regard to the foregoing, the purpose of this study is to compare and contrast B.C. and Japanese secondary teachers' conceptions of critical thinking.

It should take about 15 minutes to complete this 2 part, 2 page survey. Your identity will be kept confidential because your name is not required. Therefore, please do not put your name on this survey. If you complete the questionnaire, it will be assumed that your consent has been provided. You may chose to refuse to participate or may withdraw at any time. This study will not jeopardize your teaching position in any way. Any inquiries concerning the procedures of this study may be directed to the researcher at the above number. Thank you for your assistance.

Part 1 Classification/Card sort
Given the supplied deck of cards with critical thinking vocabulary words,

1. Choose those words that you think are relevant to "critical thinking."

2. Place the "critical thinking" cards in one pile and put aside the other cards.
(If you are unsure about the relevance, do not place that card in the "critical thinking" pile.)

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[1] This survey was originally on legal–size paper. It has been condensed to fit this format.

3. Choose the ten most significant cards and rank them 1–10. Write them in the space below:

1.
2.
3.
4.
5.
6.
7.
8.
9.
10.

Part 2 Questionnaire

1. What is your gender? ☐ Man ☐ Woman

2. What is your age? years

3. What is your main subject area (please check one box only):

☐ Language Arts
☐ Math
☐ Science
☐ Social Studies
☐ Fine Art (Art, Music & Drama)
☐ Other (please specify)
☐ Business Education
☐ Computer Science
☐ Foreign Languages
☐ Industrial Education

4. How many years teaching experience do you have? years

5. Identify the 5 most significant learning outcomes attained by your students:

6. Upon successful completion of high school students should be able to:

7. What 5 words best describe an outstanding student?

8. What is the meaning of "critical thinking"?

9. Is critical thinking part of the prescribed curriculum for your subject?

☐ Yes ☐ No ☐ Unsure

10. Is critical thinking taught in your classroom?

☐ Yes ☐ No ☐ Unsure

If you answered "Yes" to question 10, then please answer question 11.

11. How do you teach critical thinking? (use a separate page if necessary)

APPENDIX B

カナダ／ブリティシュ•　コロンビア州と日本の教師アンケート
中学・　高校教師による『批判的思考』の概念／比較研究[2]

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『批判的思考』と言う概念は、国際的に教育者から関心をよせられていますが、教師が中心となった詰め込み式の中学、高等学校のクラスでは広く発展する様子がありません。現在『批判的思考』の意味やそのスキルを広い教科／分野に取り入れる方法、又、このスキルを教える方法などが研究されています。しかし、『批判的思考』という言葉の意味そのものがはっきりせず、討論されています。批判的思考の意味を定義しようという試みはその形と機能を含んでいます。批判的思考というと、よく、創造性、問題解決をすること、収れん的論証／帰納的論証などと連想されます。しかし、批判的思考は、北米や日本の教育者に支持されていながら、その意味が理解されているのかどうかわかっていません。今までに日本とカナダの教育者がこの批判的思考をどう思っているのか比較されたこともありません。

批判的思考を生徒の中に育むために教育者はまず、その根本的な信念や、実際何がクラスのなかで実施されているかを見直さなければなりません。批判的思考の性質を知るためには、教育者は知識、学習や、思考の過程の性質とは何かを問わなければなりません。この研究では、カナダ／ブリティシュ・コロンビア州と日本の中学・高校教師が、批判的思考をどう定義しているのか、比較対照するのが目的です。

この２ページに渡るアンケートは約１５分かかります。氏名記入の必要はありません。書き入れた内容が他にもれる心配もありません。何かの理由でアンケート拒否すること、又は途中でやめることも可能です。このアンケート調査によって、あなたの教師としての立場が悪くなる心配もありません。もし、このアンケート調査において質問があれば、上記の連絡先にいつでも連絡して下さい。

パート１：（与えられたカードを使って）

１．カードのなかで『批判的思考』に関連していると思う言葉を選んで下さい。

２．関連していると思う言葉のカードとそうでないカードに分けて下さい。（もしどちらに属するかわからない場合は、”関連していないカード”の方に入れて下さい。）

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[2] This survey was originally on legal-size paper. It has been condensed to fit this format.

3．関連していると思う言葉のカードの中から、最も大切だと思う言葉を１０枚選んで，大切な言葉から(１番から10番まで）順に並べて下に書き出して下さい。

1.
2.
3.
4.
5.
6.
7.
8.
9.
10.

パート２

1．性別　　[　]男　　[　]女

2．年齢　　才

3．専門教科（1つだけ選んで下さい。）

[　]国語系
[　]数学系
[　]理科系
[　]社会系
[　]芸術系（美術、音楽、演劇など）
[　]他
[　]ビジネス系
[　]コンピューター系
[　]外国語系
[　]技術
[　]家庭

4．教師経験は何年ですか。＿＿＿＿＿　年

5．生徒が学校教育から学ぶ5つの大切なことは何ですか。

6．高校卒業にあたり、生徒は何／どんなことができるようになるべきだと思いますか。

7．5つの言葉を使ってすばらしい生徒というものを表現して下さい。

8．『批判的思考』とは、あなたにとってどういう意味ですか。

9．『批判的思考』はあなたの専門教科のカリキュラム／教育指導書の中に含まれていますか。

[　]はい　　[　]いいえ　　[　]わからない

10．『批判的思考』をあなたのクラスで教えていますか。

[　]はい　　[　]いいえ　　[　]わからない

（10ではいと答えた方は１１も答えて下さい。）

11．どのように批判的思考を教えていますか。

APPENDIX C
Critical Thinking Definers Spreadsheet

English Word	Japanese Word
Accuracy	正確さ
Active participation	積極的に参加できる
Adequacy	適切さ
Analysis	分析
Analytical skills	分析的スキル
Clarifying ideas	概念の明確化
Clarity	明瞭さ
Completeness	完成させる事ができる
Consistency	一貫性
Constructive skepticism	構成的な懐疑論
Convergent thinking	収れん的思考
Cooperative learning	協力性のある学習
Creative thinking	創造的な思考
Decision making	決断性
Deductive reasoning	演えき的推論／論証
Depth	深さ
Disciplined	躾られている
Discovery learning	発見学習
Divergent thinking	拡散的（かくさんてき）思考
Drawing conclusions	結論を出せる
Drawing inferences	推論を引き出せる
Evaluating assumptions	仮説の評価
Evaluation	評価
Fairness	公平さ
Higher order thinking	高次的思考
Hypothesize	推理できる
Identifying/removing bias	。。。が何／誰であると見極められる
Independent thinking	独立した思考性
Inductive reasoning	帰納的推論／論証
Intellectual challenges	知的挑戦
Investigate	調査できる
Logical	論理的
Metacognitive skills	メタ認知スキル
Objective	物事を客観的に見られる
Open-minded	偏見がない／心が広い／オープンマインド
Precision	精密さ／正確さ
Problem solving	問題解決
Rational thinking	合理的思考
Reasoning	理性／論証／論拠
Relevance	有用性／レリバンス
Responsible	責任感がある
Self-directed	自己規律
Significance	意義／重大性
Socratic questioning	ソクラテス的質問応答
Specificity	明確さ／明細さ
Student-centred	生徒中心
Subjective	物事を主観的に見られる
Synthesis	統合性がある
Taking ownership	物（事）を自分のものとしてとらえる
Thoughtful judgements	思慮深い／注意深い判断

APPENDIX D
Rotated Component Matrix of 50 Critical Thinking Definers

	Critical Thinking Factor Loadings				
Critical Thinking Definers	**1**	**2**	**3**	**4**	**5**
drawing inferences	.68	.16	.11	.05	.14
hypothesize	.65	.29	.14	.15	.15
convergent thinking	.59	.13	.05	.16	.03
inductive reasoning	.59	.30	.02	.06	.02
creative thinking	.50	.10	.01	-.19	.47
problem solving	.46	.09	-.15	.37	.09
drawing conclusions	.46	.19	.03	.44	.05
analysis	.40	.24	.22	.11	.04
divergent thinking	.39	.37	-.38	.18	.16
reasoning	.38	.16	.12	.34	.08
analytical skills	.36	.31	.04	.23	.05
clarifying ideas	.34	.21	.24	.20	.18
metacognitive skills	.03	.70	-.20	.18	.13
constructive skepticism	.14	.64	.08	-.06	.12
socratic questioning	.19	.61	-.02	.18	.08
identifying/removing bias	.15	.59	.06	.29	.04
rational thinking	.19	.55	.28	.05	.08
higher order thinking	.23	.54	-.06	.02	.14
evaluating assumptions	.27	.46	-.10	.26	.10
deductive reasoning	.41	.44	.00	.23	-.20
open-minded	.05	.40	.40	.00	.05
accuracy	.06	-.08	.68	.31	-.08
consistency	.02	.08	.61	-.01	.04
objective	.13	-.03	.60	-.17	.12
adequacy	.06	-.10	.57	.19	.27
specificity	.20	-.03	.54	.31	.15
precision	.12	.04	.54	.34	.08
fairness	-.22	.00	.51	.07	.31
logical	.31	.06	.49	.12	-.10
responsible	-.23	.13	.45	.17	.33
depth	.04	.35	.35	.19	.25
clarity	.12	.08	.35	.61	-.06
relevance	.22	.12	.09	.53	.07
decision making	.19	.25	-.24	.52	.16
significance	.16	.13	.17	.51	.11
completeness	-.12	-.13	.26	.51	.30
synthesis	.32	.30	.16	.41	-.11
investigate	.30	.24	.05	.32	.19
disciplined	-.02	.05	.12	.31	.15
evaluation	.10	.15	.12	.29	.18
active participation	.03	-.04	.04	.21	.62
taking ownership	-.23	.12	.21	.08	.56
discovery learning	.34	.07	.08	-.06	.56
student-centred	.13	-.01	-.04	.21	.54
intellectual challenges	.19	.22	.05	-.09	.54
self-directed	-.11	.07	.23	.05	.45
subjective	.08	.01	.08	.25	.44
independent thinking	.18	.16	.00	.14	.43
cooperative learning	-.02	.16	-.05	.42	.43
thoughtful judgements	.18	.33	.24	-.09	.39

Extraction Method: Principal Component Analysis. Rotation Method: Equamax with Kaiser Normalization. Rotation converged in 14 iterations.